

Exercise 5.3

$$\Rightarrow$$
 35 = 7 + 12 $d$ 

$$\Rightarrow 28 = 12d \Rightarrow d = \frac{7}{3}$$

Applying formula,  $S_n = \frac{n}{2} [2a + (n-1)d]$  to find sum of n terms of AP,

$$S_{13} = \frac{13}{2} \left[ 14 + (13 - 1)\frac{7}{3} \right] = \frac{13}{2} (14 + 28) = \frac{13}{2} \times 42 = 273$$

Therefore,  $d = \frac{7}{3}$  and  $S_{13} = 273$ 

(iii) Given 
$$a_{12} = 37$$
,  $d = 3$ , find a and  $S_{12}$ .

Using formula  $a_n = a + (n-1)d$ , to find n<sup>th</sup> term of arithmetic progression,

$$a_{12} = a + (12 - 1)3$$
  
 $\Rightarrow 37 = a + 33 \Rightarrow a = 4$ 

Applying formula,  $S_n = \frac{n}{2} [2a + (n-1)d]$  to find sum of n terms of AP,

$$S_{12} = \frac{12}{2} [8 + (12 - 1)3] = 6(8 + 33) = 6 \times 41 = 246$$

Therefore, a = 4 and  $S_{12} = 246$ 

(iv) Given 
$$a_3 = 15$$
,  $S_{10} = 125$ , find d and  $a_{10}$ .

Using formula  $a_n = a + (n-1)d$ , to find n<sup>th</sup> term of arithmetic progression,

$$a_3 = a + (3 - 1)(d)$$

$$\Rightarrow$$
 15 =  $a + 2d$ 

$$\Rightarrow a = 15 - 2d...(1)$$

Applying formula,  $S_n = \frac{n}{2} [2\alpha + (n-1)d]$  to find sum of n terms of AP,

$$S_{10} = \frac{10}{2} [2\alpha + (10 - 1)d]$$

$$\Rightarrow$$
 125 = 5 (2a + 9d) = 10a + 45d

Putting (1) in the above equation,

$$125 = 5[2(15-2d)+9d] = 5(30-4d+9d)$$

$$\Rightarrow 125 = 150 + 25d$$

$$\Rightarrow$$
 125 - 150 = 25d

$$\Rightarrow$$
 -25 = 25 $d\Rightarrow$   $d = -1$ 

Using formula  $a_n = a + (n-1)d$ , to find n<sup>th</sup> term of arithmetic progression,

$$a_{10} = a + (10 - 1) d$$

Putting value of d and equation (1) in the above equation,

$$a_{10} = 15 - 2d + 9d = 15 + 7d$$

$$= 15 + 7(-1) = 15 - 7 = 8$$

Therefore, d = -1 and  $a_{10} = 8$ 

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

Applying formula,  $S_n = \frac{n}{2} [2\alpha + (n-1)d]$  to find sum of n terms of AP,

$$S_9 = \frac{9}{2} [2a + (9-1)5]$$

$$\Rightarrow 75 = \frac{9}{2} [2a + 40]$$

$$\Rightarrow$$
 150 = 18a + 360

$$\Rightarrow$$
 -210 = 18 $a$ 

$$\Rightarrow a = \frac{-35}{3}$$

Using formula  $a_n = a + (n-1)d$ , to find n<sup>th</sup> term of arithmetic progression,

$$a_9 = \frac{-35}{3} + (9 - 1)(5)$$

$$=\frac{-35}{3}+40=\frac{-35+120}{3}=\frac{85}{3}$$

Therefore, 
$$a = \frac{-35}{3}$$
 and  $a_9 = \frac{85}{3}$ 

Therefore, 
$$a = \frac{-35}{3}$$
 and  $a_9 = \frac{85}{3}$ 

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

Applying formula,  $S_n = \frac{n}{2} [2a + (n-1)d]$  to find sum of n terms of AP,

$$90 = \frac{n}{2} [4 + (n-1)8]$$

$$\Rightarrow 90 = \frac{n}{2} [4 + 8n - 8]$$

$$\Rightarrow 90 = \frac{n}{2} [8n - 4]$$

$$\Rightarrow 8n^2 - 4n - 180 = 0$$

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

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

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

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

$$\Rightarrow n = 5,-9/2$$

We discard negative value of n because here n cannot be in negative or fraction.

The value of n must be a positive integer.

Therefore, n = 5

Using formula  $a_n = a + (n-1)d$ , to find n<sup>th</sup> term of arithmetic progression,

$$a_5 = 2 + (5 - 1)(8) = 2 + 32 = 34$$

Therefore, n = 5 and  $a_n = 34$ 

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

Using formula  $a_n = a + (n-1)d$ , to find n<sup>th</sup> term of arithmetic progression,

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

$$\Rightarrow$$
 62 = 8 +  $nd - d$ 

$$\Rightarrow$$
  $nd - d = 54$ 

$$\Rightarrow$$
  $nd = 54 + d...(1)$ 

Applying formula,  $S_n = \frac{n}{2} [2a + (n-1)d]$  to find sum of n terms of AP,

$$210 = \frac{n}{2} [16 + (n-1)d] = \frac{n}{2} (16 + nd - d)$$

Putting equation (1) in the above equation,

$$210 = \frac{n}{2} [16 + 54 + d - d] = \frac{n}{2} \times 70$$

$$\Rightarrow n = \frac{210 \times 2}{70} = 6 \Rightarrow n = 6$$

Putting value of n in equation (1),

$$6d = 54 + d \Rightarrow d = \frac{54}{5}$$

Therefore, n = 6 and  $d = \frac{54}{5}$ 

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

Using formula  $a_n = a + (n-1)d$ , to find  $n^{\text{th}}$  term of arithmetic progression,

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

$$\Rightarrow$$
 4 =  $a$  + 2 $n$  - 2

$$\Rightarrow$$
 6 =  $a + 2n$ 

$$\Rightarrow a = 6 - 2n...(1)$$

Applying formula,  $S_n = \frac{n}{2} [2\alpha + (n-1)d]$  to find sum of n terms of AP,

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

$$\Rightarrow -14 = \frac{n}{2}(2a + 2n - 2)$$

Putting equation (1) in the above equation, we get

$$-28 = n [2(6-2n) + 2n - 2]$$

$$\Rightarrow$$
 -28 =  $n(12 - 4n + 2n - 2)$ 

$$\Rightarrow$$
 -28 =  $n(10-2n)$ 

$$\Rightarrow 2n^2 - 10n - 28 = 0$$

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

$$\Rightarrow n^2 - 7n + 2n - 14 = 0$$

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

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

$$\Rightarrow n = -2, 7$$

Here, we cannot have negative value of n.

Therefore, we discard negative value of n which means n = 7.

Putting value of n in equation (1), we get

$$a = 6 - 2n = 6 - 2(7) = 6 - 14 = -8$$

Therefore, n = 7 and a = -8

(ix)Given a = 3, n = 8, S = 192, find d.

Using formula,  $S_n = \frac{n}{2} [2a + (n-1)d]$  to find sum of n terms of AP, we get

$$192 = \frac{8}{2} [6 + (8 - 1) d] = 4 (6 + 7d)$$

$$\Rightarrow$$
 192 = 24 + 28d

$$\Rightarrow$$
 168 = 28 $d \Rightarrow d = 6$ 

(x) Given l = 28, S = 144, and there are total of 9 terms. Find a.

Applying formula,  $S_n = \frac{n}{2}[a+l]$ , to find sum of n terms, we get

$$144 = \frac{9}{2} [a + 28]$$

$$\Rightarrow$$
 288 = 9 [a + 28]

$$\Rightarrow$$
 32 =  $a$  + 28 $\Rightarrow$   $a$  = 4

4. How many terms of the AP: 9, 17, 25, ... must be taken to give a sum of 636?

**Ans.** First term = a = 9, Common difference = d = 17 - 9 = 8,  $S_n = 636$ 

Applying formula,  $S_n = \frac{n}{2} [2a + (n-1)d]$  to find sum of n terms of AP, we get

$$636 = \frac{n}{2} [18 + (n-1)(8)]$$

$$\Rightarrow 1272 = n (18 + 8n - 8)$$
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