General Section:

1. Write down the first five terms of an A.P whose first term and common difference are given below:

a. First term (a) = 1, Common difference = 3

Solution:

Here, first term (a) = 1

Common difference (d) = 3

First five terms are,

$t_1 = a = 1$

$t_2 = a+d = 1+3 = 4$

$t_3 = a+2d = 1+2.3 = 7$

$t_4 = a+3d = 1+3.3 = 10$

$t_5 = a+4d = 1+4.3 = 13$

b. First term (a) = -2, Common difference = -2

Solution:

First term (a) = -2

Common difference (d) = -2

First five terms are;

$t_1 = a = -2$

$t_2 = a+d = -2-2 = -4$

$t_3 = a+2d = -2-2.2 = -6$

$t_4 = a+3d = -2-3.2 = -8$

$t_5 = a+4d = -2-4.2 = -10$

c. First term (a) = $\frac{3}{5}$, Common difference = $1/2$

Solution:

First term (a) = $3/5$

Common difference (d) = $1/2$

First five terms are;

$t_1 = a = 3/5$

$t_2 = a + d = 3/5 + 1/2 = 11/10$

$t_3 = a + 2d = 3/5 + 2 \cdot 1/2 = 8/5$

$t_4 = a + 3d = 3/5 + 3 \cdot 1/2 = 21/10$

$t_5 = a + 4d = 3/5 + 4 \cdot 1/2 = 13/5$

---

2. Find the 7th term and 9th term of an A.P where:

a. First term (a) = 9, common difference = 5

Solution:

First term (a) = 9

Common difference (d) = 5

7th term (t_7) = ?

9th term (t_9) = ?

We know,

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

$$t_7 = 9 + (7-1)5$$

$$= 9 + 30$$

$$= 39$$

Also,

$$t_9 = 9 + (9-1)5$$

$$= 9 + 40$$

$$= 49$$

---

b. First term (a) = $\frac{1}{3}$, Common difference = $-\frac{1}{3}$

Solution:

First term (a) = $1/3$

Common difference (d) = $-1/3$

7th term (t_7) = ?

9th term (t_9) = ?

we know,

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

$$t_7 = \frac{1}{3} + (7-1) \times -\frac{1}{3}$$

$$= \frac{1}{3} - \frac{6}{3}$$

$$= -\frac{5}{3}$$

Also,

$$t_9 = \frac{1}{3} + (9-1) \times -\frac{1}{3}$$

$$= \frac{1}{3} - \frac{8}{3}$$

$$= -\frac{7}{3}$$

---

3. Find the first term for each of the following A.P's

a. $d = -3$, 8th term $= 30$

Solution:

Common difference $(d) = -3$

8th term $(t_8) = 30$

first term $(a) = ?$

we know,

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

or $t_8 = a + (8-1) - 3$

or $30 = a - 21$

or $a = 30 + 21$

$\therefore a = 51$

b. 4^{th} term = 27, Common difference (d) = 5

Solution:

4^{th} term $(t_4) = 27$

Common difference $(d) = 5$

First term $(a) = ?$

We know,

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

or $t_4 = a + (4-1)5$

or $27 = a + 15$

or $a = 27 - 15$

$\therefore a = 12$

---

4. Find the common difference of the following arithmetic sequences.

a. First term = 3, 7^{th} term = 27

Solution:

First term $(a) = 3$

7^{th} term $(t_7) = 27$

Common difference $(d) = ?$

We know,

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

or $t_7 = 3 + (7-1)d$

or $27 = 3 + 6d$

or $\dfrac{27-3}{6} = d$

$\therefore d = 4$

---

b. $a = 13$ and $t_{31} = -77$

Solution:

First term $(a) = 13$

31^{th} term $(t_{31}) = -77$

Common difference $(d) = ?$

We know,

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

or $t_{31} = 13 + (31-1)d$

or, $-77 = 13 + 30d$

or $\frac{-77-13}{30} = d$

$\therefore d = -3$

---

5. Determine the number of terms for each of the following A.P.'s.

a. First term = 1, common difference = 6, Last term = 49

Solution:

First term (a) = 1

Last term = 49

Common difference (d) = 6

No. of term (n) = ?

We know,

Let 49 be nth term,

i.e. $t_n = 49$

or $a + (n-1)d = 49$

or $1 + (n-1)6 = 49$

or $1 + 6n - 6 = 49$

or $n = \frac{49+5}{6}$

$\therefore n = 9$

---

b. $t_n = 1$, $a = 25$, $d = -2$

Solution:

First term(a) = 15

Last term = 1

Common difference (d) = -2

no. of term(n) = ?

Let 1 be n^{th} term

i.e. $t_n = \cancel{49}\ 1$

or $a + (n-1)d = \cancel{49}\ 1$

or $15 + (n-1) - 2 = \cancel{49}\ 1$

or $15 + (-2n + 2) = \cancel{49}\ 1$

or $15 - 2n + 2 = \cancel{49}\ 1$

or $\dfrac{17 - 1}{2} = n$

$\therefore n = 8$

44, 36, 28, ..., -380

Solution:

First term(a) = 44

Last term (l) = -380

Common difference (d) = 36 - 44

= -8

No. of terms (n) = ?

Let -380 be n^{th} term

i.e. $t_n = -380$

or $a + (n-1)d = -380$

or $44 + (n-1) - 8 = -380$

or $44 - 8n + 8 = -380$

or $\dfrac{52 + 380}{8} = n$

6.e. Is -42 a term of the series $7 + 2 - 3 + \ldots$? Give reason.

Solution:

First term (a) = 7

Common difference (d) = 2 - 7

= -5

Let -42 be n^{th} term

$t_n = -42$

i.e. $a + (n-1)d = -42$

or $7 + (n-1) \cdot -5 = -42$

or $7 + (-5n + 5) = -42$

or $\frac{12 + 42}{5} = n$

$\therefore$ ~~n = 10.8~~

Hence, n is not a +ve whole number.

a. Which term of the sequences 2, 4, 6 .... 512 is 256?

Solution:

first term (a) = 2

Last term = 256

Common difference (d) = 4 - 2

= 2

No. of terms (n) = ?

Let 256 be n^{th} term

i.e $t_n = 256$

or $a + (n-1)d = 256$

or, $2 + (n-1)2 = 256$

or $2 + 2n - 2 = 256$

or $n = \frac{256}{2}$

$\therefore n = \cancel{128}\ 128.$

b. Which term of the series $3 + 6 + 9 + 12 \ldots$ is 96?

Solution:

First term (a) = 3

Last term = 96

Common difference (d) = 6 - 3

= 3

No. of term (n) = ?

Let 96 be n^{th} term

i.e. $t_n = 96$

or $a + (n-1)d = 96$

or $3 + (n-1)3 = 96$

or $\cancel{3} + 3n - \cancel{3} = 96$

or $n = \frac{96}{3}$

$\therefore n = 32$

c. How many terms are there in the series $5 + 9 + 13 + \ldots + 77$?

Solution:

First term (a) = 5

Common difference (d) = 9 - 5

= 4

Last term = 77

No. of term (n) = ?

Let 77 be n^{th} term

i.e. $t_n = 77$

or $a + (n-1)d = 77$

or $5 + (n-1)4 = 77$

or $5 + 4n - 4 = 77$

or $\frac{76}{4} = n$

$\therefore n = 19$

d. Is 65 a term of the series $9 + 11 + 13 + 15 + \dots$?

Solution:

first term$(a) = 9$

Last term $= 65$

Common difference $(d) = 11 - 9$

$= 2$

No. of terms $(n) = ?$

Let 65 be n^{th} term

i.e. $t_n = 65$

or, $a + (n-1)d = 65$

or, $9 + (n-1)2 = 65$

or, $9 + 2n - 2 = 65$

or, $\frac{58}{2} = n$

$\therefore n = 29$

It belongs to 29^{th} term.

Creative Section

7.a. If fourth and the 10^{th} term of an A.P are 75 and 117 respectively. find the first term and common difference.

Solution:

4^{th} term $(t_4) = 75$

10^{th} term $(t_{10}) = 117$

first term $(a) = ?$

Common difference $(d) = ?$

We know,

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

or, $t_4 = a + (4-1)d$

or, $75 = a + 3d \quad \text{--- (1)}$

Also,

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

or $117 = a + 9d$ — (ii)

Now,

Subtracting equation (i) from (ii)

$$117 = \cancel{a} + 9d$$
$$75 = \cancel{a} + 3d$$
$$(-) \quad (-) \quad (-)$$

$$42 = 6d$$

$\therefore d = 7$

from (i)

$75 = a + 3 \times 7$

or, $75 - 21 = a$

$\therefore a = 54.$

---

b. The 3^{rd} term and the 13^{th} term of an arithmetic sequence are -40 and 0 respectively. What is the 28^{th} term of the sequence.

Solution:

3^{rd} term $(t_3) = -40$

13^{th} term $(t_{13}) = 0$

28^{th} term $(t_{28}) = ?$

We know,

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

or, $t_3 = a + (3-1)d$

or, $-40 = a + 2d$ — (i)

Also,

$t_{13} = a + (13-1)d$

or, $0 = a + 12d$ — (ii)

Now,

Subtracting equation (i) from (ii)

$$\cancel{a} + 12d = 0$$
$$\cancel{a} + 2d = -40$$
$$(-) \quad (-) \qquad (-)$$

or, $10d = 40$

$\therefore d = 4$

from (i)

$a + 2d = -40$

or, $a + 2\times4 = -40$

$\therefore a = -48$

Again,

28^{th} term is

$t_{28} = a + (28-1)d$

$= -48 + 27\times4$

$= 60$

---

c. If the 5^{th} and 10^{th} terms of an Arithmetic Sequences are 17 and 42 respectively. Find its 20^{th} term.

Solution:

5^{th} term $(t_5) = 17$

10^{th} term $(t_{10}) = 42$

20^{th} term $(t_{20}) = ?$

~~As~~ we know

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

or, $t_5 = a + (5-1)d$

or, $17 = a + 4d$ —— (i)

Also,

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

or, $42 = a + 9d$ —— (ii)

Now,

Subtracting equation (i) from (ii)

$$\cancel{a} + 9d = 42$$
$$\cancel{a} + 4d = 17$$
$$(-) \quad (-) \quad (-)$$

$$5d = 25$$
$$\therefore d = 5$$

from (i)

$$17 = a + 4\times5$$

or, $17 - 20 = a$

$$\therefore a = -3$$

Again,

~~28~~ 20^{th} term $(t_{20}) = a + (n-1)d$

$$= -3 + (20-1)5$$
$$= -3 + 95$$
$$= 92$$

8.a. If 6^{th} term and 9^{th} term of an A.P are 23 and 35 which term is 67?

Solution:

6^{th} term $(t_6) = 23$

9^{th} term $(t_9) = 35$

Now,

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

or, $t_6 = a + (6-1)d$

or, $23 = a + 5d$ — (i)

Also,

$$t_9 = a + (9-1)d$$

or, $35 = a + 8d$ — (ii)

Subtracting equation (i) from (ii)

$$\cancel{a} + 8d = 35$$
$$\cancel{a} + 5d = 23$$
$$- \quad - \quad -$$

$$3d = 12$$

$\therefore d = 4$

from (i)

$23 = a + 5d$

or, $23 = a + 5\times4$

or, $23 - 20 = a$

$\therefore a = 3$

Let 67 be n^{th} term;

$t_n = \{a + (n-1)d$

$67 = 3 + (n-1)4$

or, $67 = 3 + 4n - 4$

or, $\frac{67+4-3}{4} = n$

$\therefore n = 17^{th}$ term

---

b. The 5^{th} term of an A.P is 28 and the 9^{th} term is 48. Is 93 a term of the sequence? give reason:

Solution:

5^{th} term $(t_5) = 28$

9^{th} term $(t_9) = 48$

Now,

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

or, $t_5 = a + (5-1)d$

or, $28 = a + 4d$ — (i)

Also,

$t_9 = a + (9-1)d$

or, $48 = a + 8d$ — (ii)

Subtracting equation (i) from (ii)

$$\begin{array}{r} \cancel{a} + 8d = 48 \\ \cancel{a} + 4d = 28 \\ (-)\quad (-)\quad (-) \\ \hline \end{array}$$

or, $4d = 28$

$\therefore d = 5$

from (i)

$28 = a + 4d$

or, $28 = a + 4 \times 5$

or, $28 - 20 = a$

$\therefore a = 8$

Let 93 be n^{th} term then

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

or, $93 = a + (n-1) 5$

or, $93 = 8 + 5n - 5$

or, $\dfrac{93 + 5 - 8}{5} = n$

$\therefore n = 18$

---

c. Is 40 a term of an arithmetic sequence whose 11^{th} term and 15^{th} terms are 23 and 35 respectively.

Solution:

11^{th} term $(t_{11}) = 23$

15^{th} term $(t_{15}) = 35$

We know,

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

$t_{11} = a + (11-1) d$

or, $23 = a + 10d$ —— (i)

Also,

$t_{15} = a + (15-1) d$

or, $35 = a + 14d$ —— (ii)

subtracting (i) from (ii)

$\cancel{a} + 14d = 35$

$\cancel{a} + 10d = 23$

$(-) \quad (-) \quad (-)$

---

or, $4d = 12$

$\therefore d = 3$

From ①

$23 = a + 10d$

or, $23 = a + 10 \times 3$

or, $23 - 30 = a$

$\therefore a = -7$

Let 40 be the n^{th} term

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

or, $40 = -7 + (n-1)3$

or, $40 = -7 + 3n - 3$

or, $\dfrac{40+7+3}{3} = n$

$\therefore n = \dfrac{50}{3}$

No, 40 is not a arithmetic sequence.

9.a. If the n^{th} term of the A.P 7, 12, 17, 22 ___ is equal to the n^{th} term of another A.P 27, 30, 33, 36 .... find the value of n.

Solution:

7, 12, 17, 22 ....

First term (a) = 7

Common difference (d) = 12 - 7

$= 5$

We know,

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

$= 7 + (n-1)5$

$= 7 + 5n - 5$ — ①

Again,

for 27, 30, 33, 36 .....

first term (a) = 27

Common difference $(d) = 3$

Now

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

$= 27 + (n-1)3$

$= 27 + 3n - 3$ —— (ii)

By question:

$7 + 5n - 5 = 27 + 3n - 3$

or, $2 + 5n = 24 + 3n$

or, $5n - 3n = 24 - 2$

or, $2n = 22$

$\therefore n = 11$

---

b. If the twelveth, 85^{th} and the last term of an arithmetic sequence are 38, 257 and 395 respectively. Calculate how many terms are there in the sequence.

Solution

12^{th} term $(t_{12}) = 38$

85^{th} term $(t_{85}) = 257$

Last term $= 395$

We know,

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

or, $t_{12} = a + (12-1)d$

or, $38 = a + 11d$ —— (i)

Also,

$t_{85} = a + (85-1)d$

or, $257 = a + 84d$ —— (ii)

Subtracting (i) from (ii)

$\cancel{a} + 84d = 257$

$\cancel{a} + 11d = 38$

$(-)\ (-)\ (-)$

or, $73d = 219$

$\therefore d = 3$

from ①

$38 = a + 11 \times 3$

or, $38 - 33 = a$

$\therefore a = 5$

Let 395 be nth term

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

or, $395 = 5 + (n-1) 3$

or, $395 = 5 + 3n - 3$

or, $\frac{395 - 5 + 3}{3} = n$

$\therefore n = 131$

$\therefore$ There are 131 terms

10.a. Ram earns a monthly salary of Rs 20,000 per month. This salary increases by Rs. 5000 per year. How much will his salary be in the 10th year?

Solution:

first term (a) = 20,000

Common difference (d) = 5000

10th term (t_{10}) = ?

we know,

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

or, $t_{10} = 20,000 + (10-1) 5000$

$= 20,000 + 45000$

$=$ Rs 65000

$\therefore$ His salary will be Rs 65000 in 10 years.

---

b. A man repays a loan of Rs 3250 by ~~first~~ paying Rs. 20 in the first day then increases the payment by Rs 15 every day. How long will it take to clear ~~th~~ his debt?

~~By~~ By question:

$S_n = \frac{n}{2}[2\times20+(n-1)15]$

or, $3250\times2 = n(40+15n-15)$

or, $6500 = 25n+15n^2$

or, $15n^2+25n-6500=0$

or, $5(3n^2+5n-1300)=0$

or, $3n^2+65n-60n-1300=0$

or, $(3n+65)(n-20)=0$

$\therefore n = 65/3$ or $n=20$

Exercise - 3.2

General Section

1. Find the sum of the following series.

a. $4+7+10+\ldots$ upto 12 terms.

Solution:

~~we know~~ $a=4$, $d=7-4=3$, $n=12$

we know,

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

$= \frac{12}{2}[2\times4+(12-1)\times3]$

$= 6(8+33)$

$= 6\times41$

$= 246$

e. $1+\frac{1}{2}+0+\ldots\ldots -\frac{17}{2}$

Solution:

Let $-\frac{17}{2}$ be nth term, then

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

or $\frac{-17}{2} = 1 + (n-1) \times -\frac{1}{2}$

or $\frac{-17}{2} - 1 = -\frac{(n-1)}{2}$

or $\frac{-17-2}{2} = -\frac{(n-1)}{2}$

or $-19 = -n+1$

or $-19-1 = -n$

$\therefore n = 20$

Now,

$S_n = \frac{n}{2}[a+l]$

$= \frac{20}{2}\left[1 - \frac{17}{2}\right]$

$= \frac{20}{2} \times \frac{(2-17)}{2}$

$= \frac{20 \times -15}{4}$

$= -75$

---

b. $44 + 39 + 34 + \ldots$ upto 50 terms

Solution:

First term(a) = 44

Common differena (d) = -5

No. of term (N) = 50

we know

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

$= \frac{50}{2}[2 \times 44 + (50-1)(-5)]$

$= 25 [88 - 245]$

$= -3925$

c. $8 + 13 + 18 + \dots\dots + 63$

Solution:

First term (a) = 8

Common difference (d) = 5

Last term (l) = 63

We know,

$$S_n = \frac{n}{2}(a + l)$$

Let 63 be n^{th} term,

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

or, $63 = 8 + (n-1)5$

or, $63 = 8 + 5n - 5$

or, $\frac{63 - 8 + 5}{5} = n$

$\therefore n = 12$

Now,

$$S_n = \frac{n}{2}(a + l)$$

$$= \frac{12}{2}(8 + 63)$$

$= 6 \times 71$

$= 426$

d. $2 - 9 - 20 - \dots\dots - 130$

Solution:

First term (a) = 2

Common difference (d) = $\cancel{-9+2}$ $-9-2$

$= -11$

2.

Last term $(l) = -130$

Let -130 be nth term;

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

or $-130 = 2 + (n-1)-11$

or $-130 = 2 - 11n + 11$

or $-130 - 11 - 2 = -11n$

or $n = \frac{-143}{-11}$

$\therefore n = 13$

Now

$S_n = \frac{n}{2}(a + l)$

$= \frac{13}{2}(2 - 130)$

$= -832$

---

f. $\frac{13}{2} + \frac{21}{4} + 4 + \ldots$ upto 8th term

Solution:

First term $(a) = \frac{13}{2}$

Common difference $(d) = -\frac{5}{4}$

No. of terms $(n) = 8$

we know,

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

$= \frac{8}{2}\left[2 \times \frac{13}{2} + (8-1)\frac{-5}{4}\right]$

$= 4(17/4)$

$= 17$

2. a. The first term of an arithmetic series is 32 with common difference 8. Find the sum of first 8 terms.

Solution:

First term (a) = 32

Common difference (d) = 8

No. of terms (n) = 8

We know,

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

$$= \frac{8}{2}(2 \times 32 + (8-1)8)$$

$$= 4(64 + 56)$$

$$= 480$$

---

b. If the fourth term of an A.P is 4 and common difference 6. Find the sum of first 16 terms.

Solution:

4th term (t_4) = 4

Common difference (d) = 6

No. of term (n) = 16

We know,

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

or, $t_4 = a + (4-1)6$

or, $4 = a + 3 \times 6$

or, $4 - 18 = a$

$\therefore a = -14$

Now,

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

$$= \frac{16}{2}[2 \times -14 + (16-1)6]$$

$= 8 \cdot (-28 + 90)$

$= 496$

3.a. The sum of 15 terms of an A.P is 435 and the common difference is 4. Find the first term.

Solution:

Sum of 15 term $(S_n) = 435$

Common difference $(d) = 4$

No. of terms $(n) = 15$

First term $(a) = ?$

We know,

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

or, $$435 = \frac{15}{2}\left(2a + (15-1)4\right)$$

or, $$\frac{435 \times 2}{15} = 2a + 56$$

or, $$\frac{58 - 56}{2} = a$$

$$\therefore a = 1$$

b. Find the first term of an arithmetic series whose sum of its first seven terms is 0 and the common difference is -3.

Solution:

Sum of series $(S_n) = 0$

Common difference $(d) = -3$

No. of terms $(n) = 7$

We know,

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

or, $$0 = \frac{7}{2}\left[2a + 6 \times (-3)\right]$$

or, $0 = 2a - 18$

or, $\frac{18}{2} = a$

$\therefore a = 9$

---

c. An arithmetic series has 10 terms. If its last term is 50 and the sum of its ten terms is 275, find the first term.

Solution:

No. of terms $(n) = 10$

Last term $(l) = 50$

Sum of series $(S_n) = 275$

first term $(a) = ?$

We know,

$$S_n = \frac{n}{2}(a + l)$$

or, $275 = \frac{10}{2}(a + 50)$

or, $55 = a + 50$

or, $55 - 50 = a$

$\therefore a = 5$

---

d. An arithmetic series with 9 terms has the sum 135. If the first term is 3, find the last term.

Solution:

No. of terms $(n) = 9$

Sum of terms $(S_n) = 135$

first term $(a) = 3$

Last term $(l) = ?$

We know,

$$S_n = \frac{n}{2}[a + l]$$

or, $135 = \frac{9}{2}[3 + l]$

or, $\frac{135 \times 2}{9} = 3 + l$

or, $30 - 3 = l$

$\therefore l = 27$

4.a. Find the number of terms in an arithmetic progression which has its first term 16, common difference 4 and the sum 120.

Solution:

First term $(a) = 16$

Common difference $(d) = 4$

Sum of number $(S_n) = 120$

No. of terms $(N) = ?$

We know,

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

or, $120 = \frac{N}{2}[2 \times 16 + (n-1)4]$

or, $240 = N[32 + 4n - 4]$

or, $240 = n(28 + 4n)$

or, $240 = 28n + 4n^2$

or, $4n^2 + 28n - 240 = 0$

or, $4(n^2 + 7n - 60) = 0$

or, $n^2 + 12n - 5n - 60 = 0$

or, $n(n+12) - 5(n+12) = 0$

or, $(n+12)(n-5) = 0$

Either	OR
$n + 12 = 0$	$n - 5 = 0$
$\therefore n = -12$	$\therefore n = 5$

b. Find the number of terms in an arithmetic series which has its first term 7, common difference 4 and the sum 900.

Solution:

First term (a) = 7

Common difference (d) = 4

Sum (s_n) = 900

No. of term (n) = ?

We know,

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

or, $900 = \cancel{900}\ \frac{n}{2}(2\times7 + (n-1)4)$

or, $1800 = n(14 + 4n - 4)$

or, $1800 = 14n + 4n^2 - 4n$

or, $4n^2 + 10n - 1800 = 0$

or, $2(2n^2 + 5n - 900) = 0$

or, $2n^2 + 45n - 40n - 900 = 0$

or, $n(2n + 45) - 20(2n + 45) = 0$

or, $(2n + 45)(n - 20) = 0$

Either	OR
$2n + 45 = 0$	$n - 20 = 0$
$\therefore n = -45/2$	$\therefore n = 20$

---

c. Find the number of terms in an arithmetic series which has its first term 49, last term −31 and the sum 153.

Solution:

First term (a) = 49

Last term (l) = −31

Sum (s_n) = 153

No. of term (N) = ?

We know,

$$S_n = \frac{n}{2}(a+l)$$

or, $153 = \frac{n}{2}(49-31)$

or, $306 = n[18]$

or, $n = \frac{306}{18}$

$\therefore n = 17$

---

d. The first and the last term of an A.P are 7 and 23 respectively. Find the no. of terms if its sum is 90.

Solution:

First term $(a) = 7$

Last term $(l) = 23$

Sum $(S_n) = 90$

No. of terms $(n) = ?$

we know,

$$S_n = \frac{n}{2}[a+l]$$

or, $90 = \frac{n}{2}[7+23]$

or, $180 = 30n$

or, $n = \frac{180}{30}$

$\therefore n = 6$

S.d. What is the common difference of an A.P when the first term is 1, the last term 50 and the sum 204.

Solution:

First term $(a) = 1$

Last term $(l) = 50$

Sum $(s_n) = 204$

Common difference $(d) = ?$

We know,

$$S_n = \frac{n}{2}(a+l)$$

$$\text{or, } 204 = \frac{n}{2}[1+50]$$

$$\text{or, } \frac{408}{51} = n$$

$$\therefore n = 8$$

Again,

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

$$\text{or, } S_8 = \frac{8}{2}[2\times1+(8-1)d]$$

$$\text{or, } 204 = 4[2+7d]$$

$$\text{or, } \frac{204}{4} = 2+7d$$

$$\text{or, } 51-2 = 7d$$

$$\text{or, } d = \frac{49}{7}$$

$$\therefore d = 7$$

5.a. The first term of an A.P is 5, number of terms is 30 and the sum of terms is 1455. Find the common difference.

Solution:

First term $(a) = 5$

Number of term $(n) = 30$

Sum of terms $(S_n) = 1455$

Common difference $(d) = ?$

We know,

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

or $1455 = \frac{30}{2}[2\times5 + (30-1)d]$

or $1455 = 15[10 + 29d]$

or $\frac{1455}{15} = 10 + 29d$

or $\frac{97-10}{29} = d$

$\therefore d = 3$

5.b. The sum of an AP of 10 terms is 210. Find the common difference if the first term is 3.

Solution:

No. of term $(n) = 10$

Sum $(S_n) = 210$

first term $(a) = 3$

Common difference $(d) = ?$

We know,

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

or $210 = \frac{10}{2}[2\times3 + (10-1)d]$

or $210 = 5[6 + 9d]$

or $\frac{210}{5} = 5(6+9d]$

or $\frac{42-6}{9} = d$

$\therefore d = 4$

5.c. The first term of an A.P is 9, the number of terms 7 and their sum is 0. Find the common difference.

Solution:

First term (a) = 9

No. of term (n) = 7

Sum (s_n) = 0

Common difference (d) = ?

We know

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

$$or,\ 0 = \frac{7}{2}[2 \times 9 + (7-1)d]$$

$$or,\ 0 = 18 + 6d$$

$$or,\ d = \frac{-18}{6}$$

$$\therefore d = -3$$

Creative Section.

6.a. If the 9th term and 29th term of A.P are 40 and 60 respectively, find the sum of first 30 terms.

Solution:

9th term (t_9) = 40

29th term (t_{29}) = 60

No. of term (n) = 30

Sum (S_n) = ?

We know,

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

$$or,\ t_9 = a + (9-1)d$$

$$or,\ 40 = a + 8d \quad \text{——} (i)$$

Also,

$$t_{29} = a + (29-1)d$$

or, $60 = a + 28d$ —— (ii)

Subtracting equation (i) from (ii)

$$\cancel{a} + 28d = 60$$
$$\cancel{a} + 8d = 40$$
$$(-) \quad (-) \quad (-)$$

or, $20d = 20$

$\therefore d = 1$

from equ. (i)

$40 = a + 8 \times 1$

or, $40 - 8 = a$

$\therefore a = 32$

Also,

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

$$= \frac{30}{2}[2 \times 32 + (30-1)d]$$

$$= 15[64 + 29d]$$

$$= 15[64 + 29 \times 1]$$

$$= 15 \times 93$$

$$= 1395$$

---

b. If the fourth term of an A.P is 1 and the sum of its first eight term is 18, find the tenth term of the series.

Solution:

4^{th} term $(t_4) = 1$

Sum $(S_n) = 18$

$t_{10} = ?$

We know,

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

or, $t_4 = a + (4-1)d$

or, $1 = a + 3d$ —— (i)

Also,

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

or, $18 = \frac{8}{2}[2a + (8-1)d]$

or, $18 = 4[2a + 7d]$

or, $18 = 8a + 28d$ —— (ii)

from subtracting equation (i) from (ii) after multiplying equation (i) by '8':

$$\begin{array}{rcl} \cancel{8a} + 28d &=& 18 \\ \cancel{8a} + 24d &=& 8 \\ (-) \quad (-) & & (-) \\ \hline 4d &=& 10 \end{array}$$

$\therefore d = 5/2$

~~Now~~

~~$t_{10} = a$~~ from (ii)

$18 = 8a + 28 \times \frac{5}{2}$

or, $18 = \frac{16a + 140}{2}$

or, $\frac{36 - 140}{16} = a$

$\therefore a = \frac{-13}{2}$

Now,

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

$= \frac{-13}{2} + (10-1) \cdot \frac{5}{2}$

$= \frac{-13}{2} + \frac{45}{2}$

$= 16$

c. If the third term of an arithmetic sequence is 1 and the fifth term is 7, find the sum of first ten term of sequence.

Solution:

Third term $(t_3) = 1$

5th term $(t_5) = 7$

S_n 6 $= ?$

We know,

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

$$t_3 = a + (3-1)d$$

or, $1 = a + 2d$ —(i)

Also,

$$t_5 = a + (5-1)d$$

or, $7 = a + 4d$ —(ii)

Subtracting (i) from (ii)

$$\begin{array}{rcl} a + 4d & = & 7 \\ a + 2d & = & 1 \\ (-)\quad (-) & & (-) \\ \hline 2d & = & 6 \end{array}$$

$\therefore d = 3$

from (i)

$1 = a + 2 \times 3$

or, $1 - 6 = a$

$\therefore a = -5$

Now,

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

or, $S_{10} = \frac{10}{2}[2 \times (-5) + (10-1)3]$

$= 5[-10 + 27]$

$= 85$

7.a. If the sum of the first three terms of an arithmetic series is 42 and that of the first 5 term is 80, find 20th term.

Solution:

Sum $(S_3) = 42$

Sum $(S_5) = 80$

~~Sum of~~ 20 term $(t_{20}) = ?$

We know,

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

$$S_3 = \frac{3}{2}[2 \times a + (3-1)d]$$

$$\text{or } \frac{42 \times 2}{3} = 2a + 2d$$

$$\text{or } 28 = 2[a + d]$$

$$\text{or } \frac{28}{2} = a + d$$

$$\text{or } a + d = 14 \text{ —— (i)}$$

Also,

$$S_5 = \frac{5}{2}[2a + (5-1)d]$$

$$\text{or } \frac{80 \times 2}{5} = 2a + 4d$$

$$\text{or } 32 = 2(a + 2d)$$

$$\text{or } a + 2d = 16 \text{ —— (ii)}$$

Subtracting (i) from (ii)

$$a + 2d = 16$$
$$a + d = 14$$
$$- \quad - \quad -$$

$$\therefore d = 2$$

Putting the value of d in equation (i).

$$14 = a + d$$

or $14 = a + 2$

$\therefore a = 12$

Again,

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

$t_{20} = 12 + (20-1)2$

$= 12 + 19 \times 2$

$= 12 + 38$

$= 50$

---

b. If the sum of first seven terms of an A.P is 14 and the sum of first ten terms is 125, then find the fourth term of the seri

Solution:

Sum of 7 terms $(S_7) = 14$

Sum of 10 terms $(S_{10}) = 125$

fourth term $(t_4) = ?$

we know,

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

or $S_7 = \frac{7}{2}[2a + (7-1)d]$

or $\frac{14 \times 2}{7} = 2a + 6d$

or $4 = 2(a + 3d)$

or $\frac{4}{2} = a + 3d$

or $a + 3d = 2$ —— (i)

Also,

$S_{10} = \frac{10}{2}(2a + (10-1)d)$

or, $125 = 5[2a + 9d]$

or $25 = 2a + 9d$ —— (ii)

Multiplying equation by 2 and subtracting (i) from (ii)

$$2a + 9d = 25$$
$$2a + 6d = 4$$
$$(-) \quad (-) \quad (-)$$

$$3d = 21$$
$$\therefore d = 7$$

putting the value of 'd' in equation (ii)

$$2a + 6 \times 7 = 4$$

or $a = \frac{-38}{2}$

$$\therefore a = -19$$

Now,

$$t_4 = a + (n-1)d$$
$$= -19 + (4-1)7$$
$$= -19 + 21$$
$$= 2$$

---

c. The sum of first 4 terms of an AP is 26 and the sum of first 8 terms is 100. Find the sum of first 12 terms.

Solution:-

Sum of 4 terms $(S_4) = 26$

Sum of 8 term $(S_8) = 100$

Sum of 12 term $(S_{12}) = ?$

We know,

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

$$S_4 = \frac{\cancel{26}4}{2}\left(2a + (4-1)d\right)$$

or $26 = 2\left[2a + 3d\right]$

or $13 = 2a + 3d$ —— (i)

Also,

$$S_8 = \frac{8}{2}[2a+(8-1)d]$$

or, $100 = 4[2a+7d]$

or, $25 = 2a+7d$ —— (ii)

Subtracting (i) from (ii)

$$\begin{array}{r} 2a+7d=25 \\ 2a+3d=13 \\ (-)\quad(-)\quad(-) \\ \hline 4d=12 \end{array}$$

$\therefore d = 3$

Putting the value of d in equation (i)

$13 = 2a + 3\times 3$

or, $\frac{13-9}{2} = a$

$\therefore a = 2$

Now,

$$S_{12} = \frac{12}{2}[2\times 2+(12-1)3]$$

$= 6[4+33]$

$= 6\times 37$

$= 222$

8.a. Find three numbers in A.P such that their sum is ~~to~~ 36 and their product is 1140.

Solution:

If 'a' be the first term and 'd' ~~b~~ be the common difference then,

$a-d$, a, $a+d$ are three terms of A.P

By question,

$(a-d)+a+(a+d) = 36$

or $a - \cancel{d} + a + a + \cancel{d} = 36$

or $3a = 36$

$\therefore a = 12$

Again,

$(a-d) \times (a) \times (a+d) = 1140$

or $(a^2 - d^2)\, a = 1140$

or $(12^2 - d^2)\, 12 = 1140$

or $144 - d^2 = \frac{1140}{12}$

or $\cancel{144 - d^2 = 95} = d^2$

or $1728 - 12d^2 = 1140$

or $1728 - 1140 = 12d^2$

or $\frac{588}{12} = d^2$

or $(7)^2 = d^2$

$\therefore d = \pm 7$ cm

when,

$a = 12$ and $d = 7$

The terms are:

$a - d = 12 - 7 = 5$

$a = 12 = 12$

$a + d = 12 + 7 = 19$

when, $a = 12$ and $d = -7$

The terms are:

$a + d = 12 - 7 = 5$

$a = 12$

$a - d = 12 + 7 = 19$

Date:.................
Page:.................

b. Find three numbers in A.P such that their sum is 21 and their product is 280.

Solution:

If 'a' is the first term and 'd' is the common difference then $a-d$, a and $a+d$ are three terms of A.P

By question

$a-d+a+a+d = 21$

or, $3a = 21$

$\therefore a = 7$

Again,

$(a-d) \times a \times (a+d) = 280$

or, $(a^2-d^2)\,a = 280$

or, $(7^2-d^2)\,7 = 280$

or, $343 - 7d^2 = 280$

or, $\frac{343-280}{7} = d^2$

or, $d = \pm\sqrt{9}$

$\therefore d = \pm 3$

When, $a=7$ and $d=3$, the terms are:

$a+b = 7+3 = 10$

$a = 7$

$a-b = 7-3 = 4$

Also,

when, $a=7$ and $d=-3$, the terms are

$a+b = 7-3 = 4$

$a = 7$

$a-b = 7+3 = 10$

---

c. Find the three numbers in A.P such that their sum is 12 and the sum of their squares is 50.

Solution:

If 'a' is the first term and 'd' is the difference then $a-d, a, a+d$ are the three terms.

By question

$a-d+a+a+d = 12$

or $3a = 12$

$\therefore a = 4$

Also,

$(a-d)^2 + a^2 + (a+d)^2 = 50$

or $a^2 - 2a\cancel{d} + d^2 + a^2 + a^2 + 2a\cancel{d} + d^2 = 50$

or $3a^2 + 2d^2 = 50$

or $3 \times 4^2 + 2 \times d^2 = 50$

or $2d^2 = 50 - 32$

or $d^2 = \frac{18}{2}$

or $d = \pm\sqrt{9}$

$\therefore d = \pm 3$

When $a = 4$ and $d = 3$, the terms are

$a+b = 4+3 = 7$

$a = 4$

$a-b = 4-3 = 1$

Also

When $a = 4$ and $d = -3$, the terms are

$a+b = 4-3 = 1$

$a = 4$

$a-b = 4+3 = 7$

9a. If the ~~fifth~~ 6th term of AP is 46, find the sum of first 11 terms.

Solution:

Given,

6^{th} term $(t_6) = 46$

Sum of 11 term $(S_{11}) = ?$

We know

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

$t_6 = a + 5d$

or, $46 = a + 5d$ —— (1)

Also,

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

$S_{11} = \frac{11}{2}(2a + (11-1)d]$

$S_n = \frac{11}{2}[2a + 10d]$

$S_n = \frac{11}{\cancel{2}} \times \cancel{2}(a + 5d]$

$S_{11} = 11 \times 46 \quad [\because a+5d = 46]$

$S_{11} = 506$

$\therefore S_{11} = 506$

---

b. In an arithmetic sequence, the sixth term is equal to 3 times the fourth term and the sum of the first three term is -12. Find AP

Solution:

By question:

$t_6 = 3 \times t_4$

or, $a + (n-1)d = 3(a + (n-1)d]$

or, $a + (6-1)d = 3[a + (4-1)d]$

or, $a + 5d = 3a + 9d$

or, $-2a = 4d$

$\therefore a = -2d$ —— (1)

Also,

$S_3 = -12$

or, $\frac{n}{2}(2a + (n-1)d] = -12$

or $\frac{3}{2}\left[2\cdot a + (3-1)d\right] = -12$

or $\frac{3}{2}\left[2a + 2d\right] = -12$

or $\frac{3}{2}\left[(2 \times -2d) + 2d\right] = -12$

or $\frac{3}{2}\left[-4d + 2d\right] = -12$

or $\frac{3}{\cancel{2}} \times -\cancel{2}d = -12$

or $\cancel{-}3d = \cancel{-}12$

$\therefore d = 4$

from (1)

$a = -2d$

or $a = -2 \times 4$

$\therefore a = -8$

Now, AP is given below,

~~$a, a+d, a+2d$~~ $\quad a = -8$

~~$= -8, -8+4$~~ $\quad a+d = -8+4 = -4$

$a+2d = -8+2\times 4 = 0$

---

c. If the 8th term of an AP is 45, find the sum of first 15 terms

Solution:

8^{th} term $(t_8) = 45$

we know,

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

or $t_8 = a + (8-1)d$

or $45 = a + 7d$ —— (1)

Also,

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

or, $S_{15} = \frac{15}{2}[2a + (15-1)d]$

$= \frac{15}{2}[2a + 14d]$

$= \frac{15}{\cancel{2}} \times \cancel{2}(a + 7d)$

$= 15 \times 45$

$= 675$

Ans

Q.a. The first and last term of an A.S are -24 and 72 respectively. If the sum of all terms ~~are~~ of series is 600. find the number of terms and common difference.

Solution:

First term$(a) = -24$

Last term $(l) = 72$

Sum$(S_n) = 600$

No. of terms$(n) = ?$

Common difference$(d) = ?$

we know,

$S_n = \frac{n}{2}[a + l]$

or, $600 = \frac{n}{2}[-24 + 72]$

~~Again~~ or, $1200 = n \times 48$

or, $n = \frac{1200}{8}$

$\therefore n = 25$

Again,

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

or, $600 = \frac{25}{2}[2\times -24 + (25-1)d]$

or, $24 = \frac{1}{2}[48 + 24d]$

or, $48 = -48 + 24d$

or, $\frac{96}{24} = d$

$\therefore d = 4$

---

b. In an A.S, the sum of first ten terms is 520. If the seventh term is double of third term, calculate the first term and common difference.

Solution:

Sum of ten terms $(S_{10}) = 520$

~~t7~~ By question:

$t_7 = 2t_3$

or, $a + (n-1)d = 2(a + (n-1)d)$

or, $a + (7-1)d = \cancel{a + (3-1)} 2\{a + (3-1)d\}$

or, $a + 6d = 2a + 4d$

or, $6d - 4d = 2a - a$

or, $2d = a$ ——— (1)

We know,

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

or, $520 = \frac{10}{2}(2\times 2d + 9d)$

or, $\frac{1040}{10} = 4d + 9d$

or, $\frac{104}{13} = d$

$\therefore d = 8$

Putting the value of d in equation (i)

$a = 2d$

or, $a = 2 \times 8$

$\therefore a = 16$

11a. Find the sum of the first 50 natural numbers.

Solution:

First term(a) = ~~50~~ 1

Last term(l) = 50

No. of terms (n) = 50

We know,

$$S_n = \frac{n}{2}(a+l)$$

$$\text{or, } S_{50} = \frac{50}{2}(1+50)$$

$$\text{or, } S_{50} = 25 \times 51$$

$$\therefore S_{50} = 1275$$

---

b. Find the sum of the first 100 odd numbers.

Solution:

The sequence of odd number is 1, 3, 5 ....

First term (a) = 1

Common difference (d) = 2

No. of term (n) = 100

Sum(S_n) = ?

We know,

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

$$\text{or, } S_{100} = \frac{100}{2}\left[2 \times 1 + 99 \times 2\right]$$

$$\therefore S_{100} = 10{,}000$$

c. Find the sum of first 50 even numbers.

Solution:

~~Series~~ The sequence of first 50 even no. is 2, 4, 6, 8 ....

First term (a) = 2

Common difference (d) = 2

No. of term (n) = 50

Sum of term (S_n) = ?

We know,

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

or, $$S_{50} = \frac{50}{2}[2\times2 + 49\times2]$$

or, $$S_{50} = 25\times102$$

$$\therefore S_{50} = 2550$$

12a. Find the sum of all numbers between 200 and 400 divisible by 7.

Solution:

The sequence of no. between 200 and 400 which are divisible by 7 is 203, 210, 217, 224, ... ~~399~~ 399

First term (a) = 203

Common difference (d) = 210-203

= 7

Last term (l) = 399

We know,

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

or, $$399 = 203+(n-1)7$$

or, $$399 = 203+7n-7$$

or, $$\frac{399-203+7}{7} = n$$

$$\therefore n = 29$$

Now,

$$S_n = \frac{n}{2}\left(\cancel{2a+l}\ (a+l)\right)$$

$$= \frac{29}{2}\left[203 + 399\right]$$

$$\therefore S_n = 8729$$

b. Find the sum of all numbers between 1 and 100 which are divisible by 3.

Solution:

The sequence of no. between 1 and 100 which are divisible by 3 are 3, 6, 9, 12 99

Here,

first term $(a) = 3$

Last term $(l) = 99$

Common difference $(d) = 12-9$

$= 3$

We know,

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

or $99 = 3 + (n-1)3$

or $99 = 3 + 3n - 3$

or $\frac{99}{3} = n$

$\therefore n = 33$

Now,

$$S_n = \frac{n}{2}(a+l)$$

$$= \frac{33}{2}(3+99)$$

$$= 1683$$