

ARITHMETIC PROGRESSIONS

5

- Series having common difference.

- Standard Form: $a, a+d, a+2d, a+3d \dots$
where, a = First term
 d = common difference.

- Example: 3, 5, 7, 9, ...

$$a = 3, d = 2$$

- General term: $\textcircled{2} n^{\text{th}} \text{ term} = a + (n+1)d$
 ~~a = first term~~
 ~~d = common difference~~
 ~~n = no. of terms.~~

Exercise 5.1

1. (i) The Taxi fare after each Kilometer - - - additional km.

Yes, 15, 23, 31, ... forms an AP as each succeeding term is obtained by adding 8 in its preceding term.

- (ii) The amount of air present - - - at a time.

$$a = V = \text{Volume of cylinder} = T_1$$

$$T_2 \Rightarrow V - \frac{1}{4}V = \frac{3}{4}V$$

$$T_3 \Rightarrow \frac{3}{4}V - \frac{1}{4} \times \frac{3}{4}V = \frac{12-3}{16}V = \frac{9}{16}V = \left(\frac{3}{4}\right)^2 V$$

$$\therefore v, \frac{3}{4}v, \left(\frac{3}{4}\right)^2 v \dots$$

$$T_2 - T_1 = \frac{1}{4}$$

$$T_3 - T_2 = \frac{9}{16}v - \frac{12}{16}v = -\frac{3}{16}v$$

\therefore Not an AP

(iii) The cost of digging - - - meter

$$T_1 = a = 150$$

$$T_2 = 150 + 50 = 200$$

$$\therefore 150, 200, 250 \dots$$

$$T_3 - T_2 = 50$$

$$T_2 - T_1 = 50$$

It is an AP

(iv) The amount of money - - - per annum

Time	Amount	Interest
After 1 year	$A = P \left[1 + \frac{R}{100}\right]^n$ $= 10800 \left[1 + \frac{8}{100}\right]$	$= 800$

$$\text{After 2 years } A = 10800 \left[\frac{108}{100}\right]^2 = 11664$$

$$\text{After 3 years } A = 10800 \left[\frac{108}{100}\right]^3 = 12597.12$$

(0800, 11664, 12597.12) 700.

$$T_3 - T_2 = 933.12$$

$$T_2 - T_1 = 800$$

Not an AP.

2. Write first Four --- as follows:

$$(i) a = 10, d = 10$$

$$a = 10$$

$$a + d = 20$$

$$a + 2d = 30$$

$$a + 3d = 40$$

$$(ii) a = -2, d = 0$$

$$a = -2$$

$$a + d = -2$$

$$a + 2d = -2$$

$$a + 3d = -2$$

$$(iii) a = 4, d = -3$$

$$a = 4$$

$$a + d = 1$$

$$a + 2d = -2$$

$$a + 3d = -5$$

$$(iv) a = -1, d = \frac{1}{2}$$

$$a = -1$$

$$a + d = -0.5$$

$$a + 2d = 0$$

$$a + 3d = 0.5$$

3. For the following APs, --- difference:

$$(i) 3, 1, -1, -3, \dots$$

$$a = 3$$

$$T_2 - T_1 = 2$$

$$T_3 - T_2 = 2$$

$$d = 2$$

$$(i) a = -2, d = 0$$

$$a = -2$$

$$(ii) -5, -1, 3, 7$$

$$a = -5$$

$$T_2 - T_1 = -1 + 5 = 4$$

$$T_3 - T_2 = 3 + 1 = 4$$

$$d = 4$$

X 125
80 85

(iii) $\frac{1}{3}, \frac{5}{3}, \frac{9}{3}, \frac{13}{3}.$

$a = \frac{1}{3}$

$T_2 - T_1 = \frac{5}{3} - \frac{1}{3} = \frac{4}{3}$

$T_3 - T_2 = \frac{9}{3} - \frac{5}{3} = \frac{4}{3}$

$d = \frac{4}{3}$

(iv) 0.6, 1.7, 2.8, 2.9

$a = 0.6$

$T_2 - T_1 = 1.7 - 0.6 = 1.1$

$T_3 - T_2 = 2.8 - 1.7 = 1.1$

$d = 1.1$

4) Which of the following - - - more terms.

(i) 2, 4, 0, 8, 16, ...

$a = 2$

⊗

$T_2 - T_1 = 2$

$T_3 - T_2 = 4$

Not an AP

(ii) $\frac{2}{2}, \frac{5}{2}, 3, \frac{7}{2}$

$a = 2$

$T_2 - T_1 = \frac{1}{2}$

$T_3 - T_2 = \frac{1}{2}$

3 more Terms:

$T_5 = a + 4d = 4$

$T_6 = a + 5d = 9/2$

$T_7 = a + 6d = 5$

(iii) -1.2, -3.2, -5.2, -7.2, ...

$a = -1.2$

$T_2 - T_1 = -2$

$T_3 - T_2 = -2$

$d = 2$

$T_5 = a + 4d = \text{⊗} -9.2$

$T_6 = a + 5d = -11.2$

$T_7 = a + 6d = -13.2$

(iv) $-10, -6, -2, 2$

$$a = -10$$

$$T_2 - T_1 = 4$$

$$T_3 - T_2 = 4$$

$$d = 4$$

$$T_5 = a + 4d = 6$$

$$T_6 = a + 5d = 10$$

$$T_7 = a + 6d = 14$$

(v) $3, 3 + \sqrt{2}, 3 + 2\sqrt{2}, 3 + 3\sqrt{2}, \dots$

$$a = 3$$

$$T_2 - T_1 = \sqrt{2}$$

$$T_3 - T_2 = \sqrt{2}$$

$$d = \sqrt{2}$$

$$T_5 = a + 4d = 3 + 4\sqrt{2}$$

$$T_6 = a + 5d = 3 + 5\sqrt{2}$$

$$T_7 = a + 6d = 3 + 6\sqrt{2}$$

(vi) $0.2, 0.22, 0.222, 0.2222\dots$

$$a = 0.2$$

$$T_2 - T_1 = 0.02$$

$$T_3 - T_1 = 0.002$$

\therefore Not an AP

(vii) $8, -4, -8, -12 \dots$

$$a = 8$$

$$T_2 - T_1 = -4$$

$$T_3 - T_2 = -4$$

$$d = -4$$

$$T_5 = -16$$

$$T_6 = -20$$

$$T_7 = -24$$

(viii) $\frac{-1}{2}, \frac{-1}{2}, \frac{-1}{2}, \frac{-1}{2}$

$$a = \frac{-1}{2}$$

$$T_3 - T_2 = 0$$

$$T_2 - T_1 = 0$$

$$T_5 = \frac{-1}{2}, T_6 = \frac{-1}{2}, T_7 = \frac{-1}{2}$$

(iv) $1, 3, 9, 27 \dots$

$$a = 1$$

$$T_2 - T_1 = 2$$

$$T_3 - T_2 = 6$$

Not an AP

(v) $a, 2a, 3a, 4a \dots$

$$a = a$$

$$T_2 - T_1 = a$$

$$T_3 - T_2 = a$$

$$d = a$$

$$T_5 = 5a$$

$$T_6 = 6a$$

$$T_7 = 7a$$

(vi) a, a^2, a^3, a^4

$$a = a$$

$$T_2 - T_1 = a^2 - a$$

$$T_3 - T_2 = a^3 - a^2$$

$$d$$

∴ Not an AP

(vii) $\sqrt{2}, \sqrt{8}, \sqrt{18}, \sqrt{32} \dots$

$$a = \sqrt{2}$$

$$T_2 - T_1 = 2\sqrt{2} - \sqrt{2} = \sqrt{2}$$

$$T_3 - T_2 = \sqrt{2}$$

$$d = \sqrt{2}$$

$$T_5 = \sqrt{50}$$

$$T_6 = \sqrt{72}$$

$$T_7 = \sqrt{98}$$

(viii) $\sqrt{3}, \sqrt{6}, \sqrt{9}, \sqrt{12}$

$$a = \sqrt{3}$$

$$T_3 - T_2 = \sqrt{9} - \sqrt{6}$$

$$T_2 - T_1 = \sqrt{6} - \sqrt{3}$$

Not an AP

Date. _____

Page No. _____

(XIV) $1^2, 3^2, 5^2, 7^2 \dots$

$$a = 1^2 = 1$$

$$T_2 - T_1 = 8$$

$$T_3 - T_2 = 16$$

Not an AP

(XV) $1^2, 5^2, 7^2, 73 = \dots$

$$a = 1$$

$$T_2 - T_1 = 24$$

$$T_3 - T_2 = 24$$

$$d = 24$$

$$\begin{aligned} T_5 &= 97 \\ T_6 &= 121 \\ T_7 &= 145 \end{aligned}$$

Ex 5.2

1. Fill in the blanks:

	a	d	n	a_n
i)	7	3	8	28
ii)	-18	2	10	0
iii)	46	-3	18	-5
iv)	-18.9	2.5	10	3.6
v)	3.5	0	105	

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

$$28 = 7 + (7)3$$

$$(iv) 3.6 = 18.9 + [n-1]2.5$$

$$10 = n$$

$$(ii) 0 = -18 + [9]d$$

$$18 = 9d$$

$$2 = d$$

$$(v) a_{21} = 3.5 + [10]0$$

$$= 3.5$$

$$(iii) -5 = a + [17]-3$$

$$46 = a$$

2. Choose the correct choice:

(i) 30th term of AP, 10, 7, 4...

$$a = 10$$

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

$$d = -3$$

$$= 10 + (29)(-3)$$

$$a_{21} = 30$$

$$a = -77$$

(iii) 11th term of AP: $-3, -\frac{1}{2}, 2 \dots$

$$a = -3$$

$$d = 2.5$$

$$n = 11$$

$$\begin{aligned} a_n &= a + [n-1]d \\ &= -3 + [10] 2.5 \\ &= 22 \end{aligned}$$

3. (i) $2, \boxed{14}, 26$

$$a = 2$$

$$a + 2d = 26$$

$$d = 12$$

$$a + d = 14$$

(ii) $\boxed{18}, 13, \boxed{18}, 3$

$$a + d = 13$$

$$a = 18$$

$$a + 3d = 8$$

~~$-2d = 10$~~

~~$d = -5$~~

(iii) $8, \square, \square, 19\frac{1}{2}$

$$a = 8$$

$$a + 3d = 19\frac{1}{2}$$

$$a + d = 6\frac{1}{2}$$

~~$3d = 19\frac{1}{2}$~~

$$a + 2d = 8$$

~~$d = 3\frac{1}{2}$~~

(iv) $0, -4, \square, \square; \square, \square, 6$

$$a = -4$$

$$a + 5d = 6$$

$$d = 2$$

$$a + d = -2$$

$$a + 2d = 0$$

$$a + 3d = 2$$

$$a + 4d = 4$$

(v) $\boxed{\quad}, 38, \boxed{\quad}, \boxed{\quad}, \boxed{\quad}, -22$

$$a + d = 38$$

$$(i) \underline{a + 5d = -22}$$

$$-4d = 60$$

$$d = -15$$

$$a = 53$$

$$a + 2d = 28.23$$

$$a + 3d = 8$$

$$a + 4d = -7$$

4) Which term of AP: $3, 8, 13, 18, \dots$ is 78

$$a = 3$$

$$78 = 3 + [n-1]5$$

$$d = 5$$

$$75 = sn - 5$$

$$a_n = 78$$

$$80 = 5n$$

$$n =$$

$$16 = n$$

5) Find the number of terms in APs.

(i) $7, 13, 19, \dots, 205$

$$a = 7$$

$$208 = 7 + [n-1]6$$

$$d = 6$$

$$34 = n$$

$$a_n = 208$$

$$n =$$

(ii) $18, 15\frac{1}{2}, 13, \dots, -47$

$$a = 18$$

$$d = -2.5$$

$$a_n = 47$$

$$n =$$

$$-47 = 18 + [n-1] \times (-2.5)$$

$$27 = n$$

6. Check whether -150 is a term of AP 11, 8, 5, ...

$$a = 11$$

$$d = -3$$

$$\therefore -150 = T_n$$

$$-150 = a(n-1)d$$

$$-150 = 11 + (n-1)(-3)$$

Since, n is not a natural no.

-150 is not a term of AP

$$-161 = (n-1)(-3)$$

$$\frac{164}{3} = n$$

7. Find the 31st term of an AP - - - 73

~~$$a = ?$$~~

~~$$a + 10d = 38$$~~

~~$$a + 15d = 73$$~~

~~$$5d = 35$$~~

~~$$d = 7$$~~

$$a + 10d = 38$$

$$a = -32$$

$$\begin{aligned} T_{31} &= -32 + (30) 7 \\ &= -32 + 210 \\ &= 178 \end{aligned}$$

8. An AP consists of 50 terms - - - 29th term.

$$a + 2d = 12$$

~~$$\begin{array}{r} 706 \\ 112 \\ \hline 594 \end{array}$$~~

$$a + 28d =$$

$$8 + 56 = 64$$

$$-47d = 84$$

$$d = 2$$

$$a = 12 - 4$$

$$= 8$$

Q7 If 3rd and 9th terms of an AP --- zero.

$$a + 2d = 4$$

$$a + 8d = -8$$

$$\begin{array}{r} (-) \\ (+) \\ \hline -6d = 12 \end{array}$$

$$d = -2$$

$$a = 4 + 4$$

$$a = 8$$

$$8 + (n-1) - 2 = 0$$

$$-2n + 2 = -8$$

$$-2n = -10$$

$$\boxed{n = 5}$$

10. The 17th term of AP --- common difference.

$$T_{17} - T_{10} = 7$$

$$a + 16d - [a + 9d] = 7$$

$$a + 16d - a - 9d = 7$$

$$d = 1$$

11. Which term of the AP : 3, 15, 27 --- 54 term.

$$a = 3$$

$$a + (n-1)d = 132 + a + 53d$$

$$d = 12$$

$$3 + (n-1) \cdot 12 = 132 + 3 + 53 \cdot 12$$

$$T_n = 132 + 784$$

$$n = 65$$

12. Two APs have same 1000th term

AP I

$$a + 99d$$

$$A + 99d$$

$$\boxed{a - A = 100}$$

AP II

$$a + 999d$$

$$A + 999d$$

$$\boxed{a - A = 100}$$

13. How many three digit numbers divisible by 7.

Date. _____

Page No. _____

Smallest 3-digit no divisible by 7 $\rightarrow 105$

Smallest Highest 3-digit no. divisible by 7 $\rightarrow 994$

105, 112, ..., 994

$$a = 105$$

$$994 = 105 + (n-1)7$$

$$d = 7$$

$$994 = 105 + 7n - 7$$

$$n^{\text{th}} = 994$$

$$128 = 9 \cdot n$$

14. How many multiples of 4 are there between 10 and 250?

Multiple of 4 after 10 $\rightarrow 12$

Multiple of 4 before 250 $\rightarrow 248$

12, 16, ..., 248

$$a = 12$$

$$248 = 12 + (n-1)4$$

$$d = 4$$

$$248 = 12 + 4n - 4$$

$$n^{\text{th}} = 248$$

$$60 = n$$

15. For what value of n , are they equal.

AP I : 63, 65, 67, ...

AP II : 3, 10, 17, ...

$$a = 63, d = 2$$

$$a = 3, d = 7$$

$$63 + (n-1)2 = 3 + (n-1)7$$

$$63 + 2n - 2 = 3 + 7n - 7$$

$$n = 13$$

Q16. Determine the AP 12th term by 12.

AP: 4, 10, 16, ...

$$a + 2d = 16$$

$$a + 6d = a + 4d + 12$$

$$4d = 12$$

$$a + 2d = 16$$

$$a + 12 = 16$$

$$a = 4$$

Q17. Find the 20th term - - - 253.

$$a = 253$$

$$d = -5$$

$$n = 20$$

$$n^{\text{th}} \text{ term} =$$

$$\cancel{253} =$$

$$253 + (19) - 5 = 158$$

18. The sum of 4th - - first 5 terms of AP.

$$a + 3d + a + 7d = 24$$

$$a + 5d + a + 9d = 44$$

$$d = 5$$

$$\text{AP: } -13, -8, -3 \dots$$

$$2a + 11d = 24$$

$$a = -13$$

19. Subba Rao started - - - ₹ 7000.

$$a = 5000$$

$$7000 = 5000 + [n-1]200$$

$$d = 200$$

$$7000 = 5000 + 200n - 200$$

$$n^{\text{th}} \text{ term} = 7000$$

$$2200 = 200n$$

$$11y = n$$

20. Ramkali saved ₹5 in the first --- become ₹20.75.
Find n.

$$a = 5$$

$$d = 1.75$$

$$\text{nth term} = 20.75$$

$$20.75 = 5 + (n-1)1.75$$

$$15.75 = n - 1$$

$$16.75 = n$$

formulae :

i) Sum of first n terms of an AP: $S_n = \frac{n}{2} [2a + (n-1)d]$

ii) sum of first n terms of an AP when last term is known.

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

where $l = \text{last term}$

Exercise 5.3

1. Find the sum of the following APs

(i) 2, 7, 12, ... to 10 terms

$$a = 2 \quad n = 10 \\ d = 5$$

$$\begin{aligned} S_n &= [2a + (n-1)d] \frac{n}{2} \\ &= [4 + 9 \times 5] [5] \\ &= 49 \times 5 \\ &= 245 \end{aligned}$$

(ii) -37, -33, -29, ... 12 terms

$$a = -37 \quad n = 12 \\ d = 4$$

$$\begin{aligned} S_n &= n/2 [2a + (n-1)d] \\ &= 6 [-74 + 44] \\ &= -180 \end{aligned}$$

(iii) 0.6, 1.7, 2.8, ... to 100 terms

$$a = 0.6 \quad n = 100 \\ d = 1.1$$

(iv) $\frac{1}{15}, \frac{1}{12}, \frac{1}{10}, \dots$ 11 term

$$a = \frac{1}{15} = 4/60 \quad n = 11 \\ d = 1/60$$

$$\begin{aligned} S_n &= [2a + (n-1)d] \frac{n}{2} \\ &= [1.2 + (99)(1.1)] 50 \\ &= [1.2 + 108.9] \times 50 \\ &= 110.1 \times 50 \\ &= 5505 \end{aligned}$$

$$\begin{aligned} S_n &= 11/2 [8/60 + 10] [1/60] \\ &= 11/2 [18/60] \\ &= \frac{11}{2} \times \frac{18}{60} = \frac{33}{20} \end{aligned}$$

2. Find the sum given below:

(i) 7 + 10 $\frac{1}{2}$ + 14 + ... + 84

$$a = 7$$

$$n^{\text{th}} \text{ term} = 84$$

$$d = 3.5$$

$$n = ?$$

$$a + [n-1]d = 84$$

$$7 + [n-1] 7/2 = 84$$

$$n-1 = 77 \times \frac{2}{7}$$

$$n = 23$$

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

$$= \frac{23}{2} [7 + 84]$$

$$= \frac{23}{2} \times 91$$

$$= \frac{2093}{2}$$

$$= 1046.5$$

$$(ii) 34 + 32 + 30 + \dots + 10.$$

$$a = 34 \quad n^{\text{th}} \text{ term} = 10$$

$$d = -2 \quad n = ?$$

$$34 + [n-1] \cdot -2 = 10$$

$$n = 13$$

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

$$= \frac{13}{2} \times 44$$

$$= 13 \times 22$$

$$(iii) -5 + [-8] + [-11] + \dots + [-230]$$

$$= 286$$

$$a = -5 \quad n^{\text{th}} = -230$$

$$d = -3 \quad n = ?$$

$$-5 + [n-1] \cdot -3 = -230$$

$$n-1 = -225 / -3$$

$$n = 76$$

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

$$= 38 [-5 + -230]$$

$$= 38 \times [-235]$$

$$= -8930$$

3. In an AP:

(i) given $a = 5$, $d = 3$, $a_n = 50$, $n = ?$, $S_n = ?$

$$50 = 5 + [n-1] \cdot 3$$

$$45/3 = n-1$$

$$16 = n$$

$$S_n = 8 \times 55$$

$$= 440$$

(ii) Given $a = 7$, $a_{13} = 35$, $n = 13$, $d = ?$, $S_{13} = ?$

$$a = 7$$

$$a_{13} = 35$$

$$n = 13$$

$$d = ? = 7/3$$

$$S = \frac{13}{2} [2a + (n-1)d] = \frac{13}{2} [42] = 21 \times 13$$

$$7 + [12]d = 35$$

$$= 21 \times 13$$

$$d = 28/12$$

$$= 273$$

$$= 7/3$$

(iii) Given $a_1 = 37$, $d = 3$, $a = ?$, $S_{12} = ?$

$$a + [11]3 = 37$$

$$S = 6 [47]$$

$$a = 4$$

$$= 246$$

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

$$a + 2d = 15 \quad - i$$

$$2a + 4d = 30$$

$$S_{10} = \frac{10}{2} [2a + 9d] = 125$$

$$= 2a + 9d = 25 \quad - ii$$

from i & ii,

$$-5d = 5$$

$$d = -1, a = 17$$

$$a_{10} = a + 9d = 17 - 9 = 8$$

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

$$S_9 = \frac{9}{2} [2a + 40] = 705$$

$$= 18a + 360 = 150$$

$$18a = 210$$

$$a = -35/3$$

$$a_9 = a + 8d$$

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

(vi) $a = 2, d = 8, S_n = 90, n = ? , a_n =$

$$S_n = \frac{n}{2} [2 \times 2 + (n-1)8] = 90 \Rightarrow n[4 + 8n - 8] = 180 \Rightarrow 2n^2 - n - 45 = 0$$

$2n^2 - 10n + 9n - 45$
 $2n(n-5) + 9(n-5)$

$$\Rightarrow n = 5, \frac{9}{2} \\ = 5$$

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

(vii) $a = 8, a_n = 62, S_n = 210, n = ? , d = ?$

$$210 = \frac{n}{2} [8 + 62] \Rightarrow n = 6$$

$$62 = 8 + (6-1)d \Rightarrow 5d = 54 \Rightarrow d = 10.8$$

(viii) $a_n = 4, d = 2, S_n = -14, n = ? , a = ?$

$$a + (n-1)2 = 4, a = 6 - 2n$$

$$\Rightarrow -14 = \frac{n}{2} [a + 4] = \frac{n}{2} [(6 - 2n) + 4] = \frac{n}{2} [10 - 2n]$$

$$\Rightarrow n[10 - 2n] = -28 \Rightarrow 2n^2 - 10n - 28 = 0 \Rightarrow n^2 - 5n - 14 = 0$$

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

$$n = 7, -2$$

$$= 7 \quad a = 6 - 2n = 6 - 14 = 8$$

(ix) $a = 3, n = 8, S_8 = 192, d = ?$

$$S_8 = 4 [2 \times 3 + 7d] = 4 [6 + 7d] = 192 \Rightarrow 6 + 7d = 48, d = 6$$

(x) $L = 28, S_9 = 144, [\text{with 9 terms}] . \text{Find } a = ?$

$$144 = \frac{9}{2} [a + 28] \Rightarrow a + 28 = \frac{144 \times 2}{9} = 32$$

$$\Rightarrow a = 4$$

Ex: 5.3

4. How many terms of AP --- 636
 $a = 9$

$$d = 8$$

$$S_n = 636$$

$$S_n \geq \frac{[2a + (n-1)d]}{2} = 636$$

$$2$$

$$\Rightarrow n [a + 4n - 4] = 636$$

$$n = 12$$

$$\Rightarrow 4n^2 + 5n - 636 = 0$$

$$\Rightarrow (4n+53)(n-12) = 0$$

$$n = -53/4, n = 12$$

5. The first term of AP --- common difference.

$$a = 5$$

$$l = 45$$

$$\frac{n}{2} [5_0] = 400$$

$$S_n = 400$$

$$n = ?$$

$$d = ?$$

$$n = 16$$

$$a + (n-1)d = 45$$

$$5 + 15d = 45$$

$$d = 8/3$$

6. The first and last term --- sum?

$$a = 17$$

$$l = 350$$

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

$$350 = 17 [n-1] 9$$

$$d = 9$$

$$n = ?$$

$$n = 38$$

$$S_n = ?$$

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

$$= \frac{38}{2} [17 + 350]$$

$$= 19 \times 367 = 6973$$

7. Find the sum of - - - - - 22nd is 149.

$$a_{22} = 149$$

$$d = 7$$

$$S_{22} = ?$$

$$a + 21d = 149$$

$$a + 21 \times 7 = 149$$

$$a = 2$$

8. Find the Sum of - - - - - respectively.

ATQ:

$$a + d = 14$$

$$a + 50d = 210$$

$$a + 2d = 18$$

$$n = 51$$

$$d = 4$$

$$a = 10$$

$$S_{51} = \frac{51}{2} [220]$$

$$= 5610$$

9. If the sum of - - - - - n terms.

$$S_7 = 49 = \frac{7}{2} [2a + 6d]$$

$$S_{17} = 289 = \frac{17}{2} [2a + 16d]$$

$$\frac{49 \times 2}{7 \times 2} = a + 3d \Rightarrow 7 = a + 3d \text{ --- (i)}$$

$$\frac{289 \times 2}{17 \times 2} = a + 8d \Rightarrow 17 = a + 8d \text{ --- (ii)}$$

$$d = 2$$

$$a = 1$$

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

10. Show that a_1, a_2, \dots, a_n --- below:

$$(i) a_n = 3 + 4n$$

$$\text{Put } n=1$$

$$a_1 = 3 + 4$$

$$T_1 = 7$$

$$\text{Put } n=2$$

$$a_2 = 3 + 8$$

$$T_2 = 11$$

$$\text{Put } n=3$$

$$a_3 = 3 * 4 * 3$$

$$T_3 = 15$$

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

$$= \frac{15}{2} [14 + [14]4]$$

$$= 15 \times 14 + 15 \times \frac{14}{2}$$

$$= 15 \times 35$$

$$= 525$$

7, 11, 15, ...

∴ Therefore it is an AP as:

$$T_3 - T_2 = 4$$

$$T_2 - T_1 = 4$$

$$a = 7$$

$$d = 4$$

$$(ii) a_n = 9 - 5n$$

$$\text{Put } n=1$$

$$a_1 = 4$$

$$\text{Put } n=2$$

$$a_2 = -1$$

$$\text{Put } n=3$$

$$a_3 = -6$$

∴ It is an AP

Where, A

$$a = 4, d = -5$$

$$S_{15} = \frac{15}{2} [8 + [-70]]$$

$$= \frac{15}{2} \times [-62]$$

$$4, -1, -6$$

$$\text{as } a^2 - a^1 = -5$$

$$a^3 - a^2 = -5$$

$$= -(15 \times 31)$$

$$= -465$$

11. If the sum of first n term - --- n th terms.

$$S_n = 4n - n^2$$

$$\text{Put } n=1$$

$$\Rightarrow 4 - 1$$

$$a_1 = 3$$

$$\text{Put } n=2$$

$$S_2 = 8 - 4$$

$$a_1 + a_2 = 4$$

$$a_2 = 1$$

$$d = a_2 - a_1$$

$$= 1 - 3$$

$$= -2$$

$$a_3 = a + 2d$$

$$= 3 + 2(-2) = -1$$

$$a_{10} = a + 9d$$

$$= 3 + 9(-2)$$

$$= -15$$

$$a_n = a + [n-1](-2)$$

$$= 3 - 2n + 2$$

$$= 5 - 2n$$

Q12. Find the sum of --- 6.

6, 12, 18, ...

$$n = 40$$

$$a = 6$$

$$d = 6$$

$$a_n = 6 + 2 \cancel{40} 234$$

$$= 240$$

$$S_n = \frac{40}{2} [2+6]$$

$$= 20 \times 246$$

$$= 4920$$

Q13. Find the sum of --- 08.

$$n = 15$$

$$d = 8$$

$$S_{15} = ?$$

$$a = 8$$

$$a_n = 8 + 112$$

$$= 120$$

$$S_n = \frac{15}{2} [128]$$

$$= 15 \times 64 = 960$$

14. Find the sum of the odd --- 50.

$$a = 1$$

$$d = 2$$

$$a_n = 49$$

$$S_n = \frac{25}{2} [1 + 49]$$

$$= 625$$

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

$$49 = 1 + 2n - 2$$

$$25 = n$$

15. A contract on construction ---- 30 days.

200, 250, 300 ...

$$a = 200$$

$$S_n = \frac{30}{2} [200 \times 2 + 2a \times 50]$$

$$d = 50$$

$$n = 30$$

$$= 15 [400 + 1450]$$

$$= 15 \times 1850$$

$$= \text{₹} 27750$$

16. A sum of ₹ 700 is to be ----- each of the prizes.

$$S_n = 700$$

$$d = -20$$

$$n = 7$$

a = first prize

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

$$700 = \frac{7}{2} [2a + (7-1)(-20)] = \frac{7}{2} [2a - 120]$$

if a = 160 = first prize

$$\frac{700 \times 2}{7} = 2a - 120 \Rightarrow 200 = 2a - 120$$

$$a = 160$$

160, 140, 120, 100, 80, 60, 40 were the prizes of the overall academic performance.

17. In a school, - - - - -
Students?

for each class $k = 1, 2, 3 \dots 12$, each of its section plants k trees,
so that total class contributes $3k$ trees.

$$a_1 = 3$$

$$d = 3$$

$$n = 12$$

$$a_{12} = 3 + 33 = 36$$

$$S_{12} = \frac{12}{2} [3 + 36] = 234$$

18. A spiral is made up - - - - - semicircles?

Radii are : $0.5, 1.0, 1.5 \dots r_{13}$

$$a_1 = 0.5$$

$$d = 0.5$$

$$n = 13$$

$$r_{13} = a_1 + [13-1]d = 0.5 + 6 = 6.5$$

~~$$\text{Sum of radii} = \frac{13}{2} [0.5 + 6.5] = 45.5$$~~

$$L = \pi \times [\text{sum of all radii}] = \frac{22}{7} \times 45.5 \approx 143 \text{ cm}$$

19. 200 books are stacked

~~$$a = 20$$~~

~~$$d = 1$$~~

$$S_n = 200 = \frac{n}{2} [2[20] + n-1[-1]]$$

$$400 = n[41-n]$$

$$0 = 41n - n^2 - 400$$

$$0 = -41n + n^2 + 400$$

$$\Rightarrow n^2 - 41n + 400 = 0$$

$$n^2 - 16n - 25n + 400 = 0$$

$$n(n-16) - 25(n-16) = 0$$

$$n=16, 25$$

2	400
2	200
2	100
2	50
5	25
5	5
1	1

Case I, put $n=16$

$$200 = 8 [40-15]$$

$$a_{16} = a + 15d$$

$$200 = 8 \times 25$$

$$= 20 - 15 = 5$$

$$200 = 200$$

Not Case II, put $n=25$

$$200 = \frac{25}{2} [40-24]$$

$$a_{25} = a + 24d$$

$$= 200 - 24$$

$$200 = 25 \times 8$$

$$= -4$$

$$200 = 200$$

As, logs can't be negative,

$$\boxed{n=16}$$

$$\boxed{a_{16} = 5}$$

Q20. Thus so Backet - - - - -

$$T_1 = 5 \times 2 = 10$$

$$a = 10$$

$$T_2 = 8 \times 2 = 16$$

$$d = 6$$

$$T_3 = 11 \times 2 = 22$$

$$m = 10$$

$$S_{10} = 5 [2a + 9d]$$

$$= 5 \times 74$$

$$= 370 \text{ m}$$

MCQs

1. The first term of an AP is p and the common difference is q , then its 10th term is:

- a) $3p + q$
b) $p - q$

$$\cancel{a} p + 9q$$

$$d) 2p + 9q$$

2. The value of n for which $2n, (n+10), (3n+2)$ are the three consecutive terms of an AP is

- ~~a~~ 6 b) -6 c) 18 d) -18

3. The common difference of the AP $\frac{1}{p}, \frac{1-p}{p}, \frac{1-2p}{p}, \dots$ is

- a) 1 b) $\frac{1}{p}$ ~~c) -1~~ d) $-\frac{1}{p}$

4. The n^{th} term of the AP $a, 3a, 5a, \dots$ is

- a) na b) $[2n-1]a$ c) $[2n+1]a$ d) $2na$

5. 30th term of the AP $, 10, 7, 4, \dots$ is

- a) 97 b) 77 ~~c) -77~~ d) -87

6. If the first term of an AP is -5 and the common difference is 2, then the sum of the first 6 terms is:

- ~~a~~ 0 b) 5 c) 6 d) 15

7. The sum of first 16 terms of an AP: $10, 6, 2, \dots$ is

- ~~a~~ -320 b) 320 c) -352 d) -400

8. The sum of first 5 multiple of 3 is

- ~~a~~ 45 b) 55 c) 65 d) 75

9. Assertion [A] : If the second term of an AP is 13 and the fifth term is 25, then its 7th term is 33.

Reason [R] : If the common difference of an AP is 5, then $a_{18} - a_{14}$ is 25

10. Assertion [A] : If $a_{18} - a_{14} = 32$, then common difference of an AP is -8

Reason [R] : If 7 times the 7th term of an AP is equal to 11 times the 11th term, then its 18th term will be 0.

9. b) Both A and R are true but R is not the correct explanation of A.

10. d) A is false but R is true.