Chapter – 6

Progressions

- Evidence is found that Babylonians some 400 years ago, knew of arithmetic and geometric progressions.
- Among the Indian mathematicians, Aryabhata (470 AD) was the first to give formula for the sum of squares and cubes of natural numbers in his famous work "Aryabhata"
- Indian mathematician Brahmagupta (598 AD), Mahavira (850 AD) and Bhaskara (1114 – 1185 AD) also considered the sums of squares and cubes.
- **Arithmetic progression(A.P)**

An arithmetic progression (AP) is a list of numbers in which each term is obtained by term adding a fixed number 'd' to preceding term, except the first term. The fixed number'd' is called the common difference

Ex: 1, 2, 7, 10, 13……. are in AP Here d = 3

- Let $a_1, a_2, a_3, \ldots\ldots a_k, a_{k+1} \ldots\ldots a_n \ldots\ldots$ be an AP.

Let its common difference be d, then

$d = a_2 - a_1 = a_3 - a_2 =$ ______ $= a_{k+1} - a_k =$ ________

- If the first term is 'a' and the common difference is 'd' then a, a + d , a + 2d, a + 3d, ….. is an A.P.
- **General term of an A.P.**

Let 'a' be the first term and 'd' be the common difference of an A.P., Then, its nth term or general term is given by $a_n = a + (n - 1)d$

Ex: The 10th term of the A.P. given by 5, 1 – 3, – 7,……

is $a_{10} = 5 + (10 - 1)(-4) = -31$

- If the number of terms of an A.P. is finite, then it is a finite A.P.

  Ex: 13, 11, 9, 7, 5

- If the number of terms of an A.P. is infinite, then it is an infinite A.P.

  Ex: 4, 7, 10, 13, 16, 19, ……

- Three numbers in AP should be taken as a – d, a, a + d.
- Four numbers in AP should be taken as a – 3d, a – d, a + d, a + 3d.
- Five numbers in AP should be taken as a – 2d, a – d, a, a + d, a + 2d
- Six numbers in AP should be taken as a – 5d, a – 3d, a – d, a + d, a + 3d, a + 5d.
- If a, b, c are in AP, then $b=\frac{a+c}{2}$ is called the arithmetic mean if 'a' and 'c'.
- The sum of the first 'n' terms of an AP is given by $s_n=\frac{n}{2}\left[2a+(n-1)d\right]$.
- If the first and last terms of an AP are 'a' and 'l', the common difference is not given then $s_n=\frac{n}{2}[a+l]$.
- $a_n = s_n - s_{n-1}$
- The sum of first 'n' positive integers $s_n=\frac{n(n+1)}{2}$.
- **Ex:** sum of first '10' positive integers $=\frac{10(10+1)}{2}=55$.

Geometric progression (G.P.)

A Geometric Progression is a list of numbers in which each term is obtained by multiplying preceding term with a fixed number 'r' except first term. This fixed number is called common ratio 'r'.

Ex: 3, 9, 27, 81, ……. are in G.P.

Here common ratio r = 3

- A list of numbers $a_1, a_2, a_3, \ldots. a_n \ldots\ldots$ are in G. P. Then the common ratio

$$r = \frac{a_2}{a_1} = \frac{a_3}{a_2} = \ldots.. = \frac{a_n}{a_{n+1}} = \ldots..$$

- The first term of a G.P. by 'a' and common ratio 'r' then the G.P is a, ar, ar^2, …..
- If the first term and common ratio of a G.P. are a, r respectively then nth term $a_n = ar^{n-1}$.

1 Mark Questions

1. Do the irrational numbers $\sqrt{2}, \sqrt{8}, \sqrt{18}, \sqrt{32}\ldots\ldots$ form an A.P? If so find common difference?

Sol: Given irrational numbers are $\sqrt{2}, \sqrt{8}, \sqrt{18}, \sqrt{32}\ldots\ldots$

$d = a_2 - a_1$

$\Rightarrow \sqrt{8} - \sqrt{2}$

$\Rightarrow \sqrt{4 \times 2} - \sqrt{2}$

$\Rightarrow 2\sqrt{2} - \sqrt{2}$

$\Rightarrow \sqrt{2}$

$\sqrt{18} - \sqrt{8} = \sqrt{9 \times 2} - \sqrt{4 \times 2}$

$\Rightarrow 3\sqrt{2} - 2\sqrt{2}$

$\Rightarrow \sqrt{2}$

Here common difference is same. i.e $\sqrt{2}$

$\therefore$ The numbers are in A.P.

2. Write first four terms of the A.P, when the first term 'a' and common difference 'd' are given as follow.

a = – 1.25, d = – 0.25

Sol: $a_1 = a = -1.25$, $d = -0.25$

$a_2 = a + d = -1.25 - 0.25 = -1.50$

$a_3 = a + 2d = -1.25 + 2(-0.25) = -1.75$

$a_4 = a + 3d = -1.25 + 3(-0.25) = -2.00$

$\therefore$ AP = -1.25, - 1.5, - 1.75, -2.

3. Is the following forms AP? If it, form an AP, find the common difference d and write three more terms.

Sol: $\sqrt{2}, \sqrt{8}, \sqrt{18}, \sqrt{32}$........

Here $a = \sqrt{2}$

$$d = a_2 - a_1 = \sqrt{8} - \sqrt{2} = \sqrt{2 \times 4} - \sqrt{2} = 2\sqrt{2} - \sqrt{2} = \sqrt{2}$$

$$d = a_3 - a_2 = \sqrt{18} - \sqrt{8} = \sqrt{9 \times 2} - \sqrt{2 \times 4} = 3\sqrt{2} - 2\sqrt{2} = \sqrt{2}$$

$$d = a_4 - a_3 = \sqrt{32} - \sqrt{18} = \sqrt{4 \times 4 \times 2} - \sqrt{9 \times 2} = 4\sqrt{2} - 3\sqrt{2} = \sqrt{2}$$

'd' is equal for all. So it forms an AP

Next three terms

$$a_5 = a_4 + d = \sqrt{32} + \sqrt{2} = \sqrt{16 \times 2} + \sqrt{2} = 4\sqrt{2} + \sqrt{2} = 5\sqrt{2} = \sqrt{25 \times 2} = \sqrt{50}$$

$$a_6 = a_5 + d = \sqrt{50} + \sqrt{2} = \sqrt{25 \times 2} + \sqrt{2} = 5\sqrt{2} + \sqrt{2} = 6\sqrt{2} = \sqrt{36 \times 2} = \sqrt{72}$$

$$a_7 = a_6 + d = \sqrt{72} + \sqrt{2} = \sqrt{36 \times 2} + \sqrt{2} = 6\sqrt{2} + \sqrt{2} = 7\sqrt{2} = \sqrt{49 \times 2} = \sqrt{98}$$

$$\therefore \sqrt{50}, \sqrt{72}, \sqrt{98}.$$

4. If an AP $a_n = 6n + 2$ find the common difference

Sol: Let $a_n = 6n + 2$

$a_1 = 6(1) + 2 =$

$= 6 + 2$

$= 8$

$a_2 = 6(2) + 2 = 12 + 2 = 14$

$a_3 = 6(3) + 2 = 18 + 2 = 20$

$d = a_2 - a_1$

$= 14 - 8$

$= 6.$

Common difference = 6.

5. In G.P. 2, -6, 18, -54 …… find a_n

Sol: $a = 2$

$$r = \frac{a_2}{a_1} = \frac{-6}{2} = -3$$

$a_n = a.r^{n-1}$

$= 2.(-3)^{n-1}$

6. The 17^{th} term of an A.P exceeds its 10^{th} term by 7. Find the common difference.

Sol: Given an A.P in which $a_{17} = a_{10} + 7$

$\Rightarrow a_{17} - a_{10} = 7 \Rightarrow (a + 16d) - (a + 9d) = 7$

$\Rightarrow 7d = 7$

$$\Rightarrow d = \frac{7}{7} = 1$$

7. A man helps three persons. He ask each or them to give their help another three persons. If the chain continued like this way. What are the numbers obtained this series

Sol: First person = 1

No.of person taken help from 1^{st} person = 3

No.of person taken help from the persons taken help from first person $= 3^2 = 9$

Similarly, no.of persons taken help 27, 81, 243, … progression 1, 3, 9, 27, 81, 243 …..

In the above progression $a_1 = 1$, $a_2 = 3$, $a_3 = 9$

Common ratio (r) $= \frac{a_2}{a_1} = \frac{a_3}{a_2} = \frac{3}{1} = \frac{9}{3} = 3$

So, above progression is in G.P.

8. Find the sum of 8 terms of a G.P., whose n^{th} term is 3^n.

Sol: In a G.P. n^{th} term $(a_n) = 3^n$

$a_1 = 3^1 = 3$

$a_2 = 3^2 = 9$

$a_3 = 3^3 = 27$…….

$\therefore$ Geometric progression = 3, 9, 27……

First term (a) = 3

Common ratio (r) $= \frac{a_2}{a_1} = \frac{9}{3} = 3 > 1$

No.of terms (n) = 8

Sum of terms (s_n) $= \frac{a(r^n - 1)}{r - 1}$

Sum of 8 terms (s_8) $= \frac{3(3^8 - 1)}{3 - 1}$

$= \frac{3}{2}(3^8 - 1)$

9. In A.P n^{th} tern $a_n = a + (n - 1)$ d explain each term in it.

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

a = First term

n = No.of terms

d = Common difference

$a_n = n^{th}$ term.

10. 6, 18, 54 ….. is it in G.P. What is the common ratio?

Sol: Given that 6, 18, 54…….

$r = \frac{a_2}{a_1} = \frac{18}{6} = 3$

$r = \frac{a_3}{a_2} = \frac{54}{18} = 3$

$\frac{a_2}{a_1} = \frac{a_3}{a_2} = 3$

So, 6, 18, 54, i.. is in G.P. Common ratio = 3.

11. Find sum of series 7, 13, 19…… upto 35 terms

Sol: Given that 7, 13, 19…..

$a_1 = 7$

$d = a_2 - a, = 13 - 7 = 6$

No.of terms (n) = 35

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

$$S_{35} = \frac{35}{2}\left[2(7) + (35-1)6\right]$$

$$= \frac{35}{2}[14 + 34 \times 6]$$

$$= \frac{35}{2}[14 + 204]$$

$$= \frac{35}{2} \times 218$$

$$= 35 \times 109$$

$$= 3815.$$

12. What is 10^{th} term in the series 3, 8, 13 ………..

Sol: Given series 3, 8, 13, ……. it is in A.P.

First term (a) = 3

$d = 8 - 3 = 5$

$n = 10$

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

$= 3 + (10 - 1)(5)$

$= 3 + 45$

$= 48$

$\therefore 10^{th}$ term in given series $a_{10} = 48$.

13. can x + 2, x + 4 and x + 9 be in A.P. Justify your answer

Sol: **Given terms are:**

$x + 2, x + 4, x + 9$

$a_2 - a_1 = (x + 4) - (x + 2)$

$= 2$

$a_3 - a_2 = (x + 9) - (x + 4)$

$= x + 9 - x - 4$

$= 5$

$a_2 - a_1 \neq a_3 - a_2$.

$\therefore$ Given terms are not in A.P.

14. In a G.P., first term is 9, 7^{th} term is $\frac{1}{81}$ find the common ratio

Sol: G.P. first term $a_1 = 9 = 3^2$

7^{th} term $a_7 = \frac{1}{81} = \frac{1}{3^4}$

$a_7 = ar^6 = \frac{1}{81}$

$$\frac{7^{th}\,term}{1^{st}\,term} = \frac{a_7}{a_1} = \frac{ar^6}{a} = \frac{\frac{1}{81}}{\frac{9}{1}} = \frac{1}{81} \times \frac{1}{9}$$

$$\Rightarrow r^6 = \frac{1}{3^4} \times \frac{1}{3^2}$$

$$r^6 = \left[\frac{1}{3}\right]^6$$

$\therefore$ Common ratio r = $\frac{1}{3}$.

15. Write the general terms of an AP and GP.

Sol: The general terms of AP are a, a + d, a + 2d, a + 3d …….

The general terms of GP are a, ar, ar^2, ar^3-----

2 Mark Questions

1. Determine the A.P. whose 3[rd] term is 5 and the 7[th] term is 9.

Sol: we have

$a_3 = a + (3 - 1)\,d = a + 2d = 5$------- (1)

$a_7 = a + (7 - 1)\,d = a + 6d = 9$------- (2)

solving the pair of linear equations (1) and (2), we get

$$
\begin{array}{r}
a + 2d = 5 \text{ -------- } (1) \\
a + 6d = 9 \text{ -------- } (2) \\
- \quad - \quad - \\
\hline
-4d = -4
\end{array}
$$

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

$$d = 1$$

substitute d = 1 in equ (1)

$a + 2d = 5 \Rightarrow a + 2(1) = 5 \Rightarrow a = 5 - 2 = 3$

$\therefore a = 3$ and $d = 1$

Hence, the required AP is 3, 4, 5, 6, 7,……..

2. How many two-digit numbers are divisible by 3?

Sol: The list of two – digit numbers divisible by 3 are 12, 15, 18 ……99. These terms are in A.P. $(\because t_2 - t_1 = t_3 - t_2 = 3)$

Here, $a = 12$, $d = 3$, $a_n = 99$

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

$99 = 12 + (n - 1)\,3$

$99 - 12 = (n - 1) \times 3$

$87 = (n - 1) 3$

$n - 1 = \frac{87}{3}$

$n - 1 = 29$

$n = 29 + 1 = 30$

so, there are 30 two- digit numbers divisible by 3.

3. Find the respective term of $a_1 = 5$, $a_4 = 9\frac{1}{2}$ find a_2, a_3 in APs

Sol: Given $a_1 = a = 5$ ----- (1)

$a_4 = a + 3d = 9\frac{1}{2}$ ------ (2)

Solving the equ (1) and equ (2), we get

equ (1) – equ (2)

$(a + 3d) - a = 9\frac{1}{2} - 5$

$a + 3d - a = 4\frac{1}{2}$

$3d = \frac{9}{2}$

$d = \frac{9 \times 1}{2 \times 3}$

$\therefore d = \frac{3}{2}$

$a_2 = a + d = 5 + \frac{3}{2} = \frac{10+3}{2} = \frac{13}{2}$

$$a_3 = a_2 + d = \frac{13}{2} + \frac{3}{2} = \frac{16}{2} = 8$$

$$\therefore a_2 = \frac{13}{2}, a_3 = 8.$$

4. $a_2 = 38$; $a_6 = -22$ find a_1, a_3, a_4, a_5

Sol: Given $a_2 = a + d = 38$ -------- (1)

$a_6 = a + 5d = -22$-------- (2)

Equation (2) – equation (1)

$(a + 5d) – (a + d) = -22 – 38$

$a + 5d – a – d = -22 – 38$

$4d = - 60$

$$d = \frac{-60}{4}$$

$\therefore d = - 15$

$a_2 = a + d = 38$

$a + (- 15) = 38 \Rightarrow a – 15= 38 \Rightarrow a = 38 + 15 \Rightarrow a = 53.$

$\therefore\ a_1 = a = 53$

$a_3 = a + 2d = 53 + 2(-15) = 53 – 30 = 23$

$a_4 = a + 3d$

$= 53 + 3 (-15)$

$= 53 – 45$

$= 8$

$a_5 = a + 4d$

$= 53 + 4(-15)$

$= 53 - 60$

$= -7$

$\therefore$ $a_1 = 53$, $a_3 = 23$, $a_4 = 8$, $a_5 = -7$.

5. Which term of the A.P: 3, 8, 13, 18…… is 78?

Sol: $a_n = 78$

$a = 3$

$d = a_2 - a_1 = 8 - 3 = 5$

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

$78 = 3 (n - 1) 5$

$78 = 3 + 5n - 5$

$78 = 5n - 2$

$5n = 78 + 2$

$5n = 80$

$n = \frac{80}{5}$

$n = 16$

$\therefore 16^{th}$ term of the A.P is 78.

6. Find the 31^{st} term of an AP whose 11^{th} term is 38 and 16^{th} term is 73.

Sol: Given $a_{11} = 38$, $a_{16} = 73$ and $a_{31} = ?$

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

$a_{11} = a + 10 d = 38$ ----- (1)

$a_{16} = a + 15d = 73$ ----- (2)

$(2) - (1) \Rightarrow a + 15d = 73$

$a + 10d = 38$

$\underline{- \quad - \qquad -}$

$5d = 35$

$$d = \frac{35}{5} = 7$$

Substitute d = 7 in equ (1)

$a + 10\,d = 38$

$a + 10\,(7) = 38$

$a + 70 = 38$

$a = 38 - 70$

$a = -32$

31^{st} term $a_{31} = a + 30d$

$= -32 + 30\,(7)$

$= -32 + 210$

$= 178$

$\therefore 178$ is the 31^{st} term.

7. Find the sum of 7 + $10\frac{1}{2}$ + 14 + ----- + 84

Sol: Given terms are in A.P.

Here a = 7, d = $a_2 - a_1$ = $10\frac{1}{2} - 7 = 3\frac{1}{2} = \frac{7}{2}, a_n = 84$

$a_n = a + (n - 1)\,d = 84$

$7 + (n - 1)\left(\frac{7}{2}\right) = 84$

$(n-1)\left(\frac{7}{2}\right) = 84 - 7$

$(n-1)\left(\frac{7}{2}\right) = 77$

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

$n - 1 = 22$

$n = 22 + 1 = 23$

$\therefore\ n = 23$

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

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

$= \frac{23}{2}[91]$

$= \frac{2093}{2}$

$\therefore S_{23} = 1046\frac{1}{2}.$

8. In an AP given a = 5, d = 3, a_n = 50, find n and s_n

Sol: $a_n = a + (n - 1)\,d$

$50 = 5 + (n - 1)\,3$ $\quad (\because a = 5, d = 3, a_n = 50)$

$50 = 5 + 3n - 3$

$50 = 3n + 2$

$50 - 2 = 3n$

$3n = 48$

$$n = \frac{48}{3}$$

$\therefore n = 16$

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

$$S_{16} = \frac{16}{2}\left[2(5) + (16-1)(3)\right]$$

$= 8\,[10 + (15)\,(3)]$

$= 8\,[10 + 45]$

$= 8 \times 55$

$\therefore\ S_{16} = 440.$

9. In an AP given $a_3 = 15$, $S_{10} = 125$, find d and a_{10}

Sol: $a_3 = 15$, $S_{10} = 125$

$a_3 = a + 2d = 15$ ------------ (1)

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

$$S_{10} = \frac{10}{2}\left[2a + (10-1)d\right] = 125$$

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

$$2a + 9d = \frac{125}{5}$$

$2a + 9d = 25$ ----------- (2)

Equ (1) and equ (2)

$a + 2d = 15$ ------ $(1) \times 2$

$2a + 9d = 25$ ------ $(2) \times 1$

$$\begin{array}{r} 2a + 4d = 30 \\ 2a + 9d = 25 \\ - \quad - \quad - \\ \hline -5d = +5 \end{array}$$

$$d = \frac{+5}{-5}$$

$\therefore$ d = -1

Substitute d = -1 in equ (1)

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

$\Rightarrow a = 15 + 2 = 17$

$a_{10} = a + 9d = 17 + 9(-1) \Rightarrow 17 - 9 = 8$

$\therefore$ d = -1 and $a_{10} = 8$

10. The first and the last terms of an AP are 17 and 350 respectively. If the common difference is 9, how many terms are there and what is their sum?

Sol: Given A.P in which a = 17

Last term = l = 350

Common, difference, d = 9

We know that, $a_n = a + (n - 1)d$

$350 = 17 + (n - 1)(9)$

350 = 17 + 9n – 9

350 = 9n + 8

9n = 350 – 8

9n = 342

$$n = \frac{342}{9}$$

$\therefore$ n = 38

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

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

= 19 × 367

= 6973

$\therefore$ n = 38; S_n = 6973.

11. Which term of the G.P: 2, 2√2, 4 …… is 128?

Sol: Here a = 2, $r = \frac{2\sqrt{2}}{2} = \sqrt{2}$

Let 128 be the n^{th} term of the GP

Then $a_n = ar^{n-1} = 128$

$2(\sqrt{2})^{n-1} = 128$

$$\left(\sqrt{2}\right)^{n-1} = \frac{128}{2}$$

$$\left(\sqrt{2}\right)^{n-1} = 64$$

$$2^{\frac{n-1}{2}} = 2^6 \qquad \left(\because \sqrt{2} = 2^{\frac{1}{2}}\right)$$

$$\frac{n-1}{2} = 6 \qquad \left(\because a^m = a^n \Rightarrow m = n\right)$$

$n - 1 = 6 \times 2$

$n - 1 = 12$

$n = 12 + 1$

$\therefore$ n $= 13$

Hence 128 is the 13th term of the G.P.

12. Which term of the G.P. is 2, 8, 32, ….. is 512?

Sol: Given G.P. is 2, 8, 32, ….. is 512

$a = 2,\ r = \frac{a_2}{a_1} = \frac{8}{2} = 4$

$a_n = 512$

$a_n = ar^{n-1} = 512$

$$\begin{array}{r|l} 2 & 512 \\ \hline 2 & 256 \\ \hline 2 & 128 \\ \hline 2 & 64 \\ \hline 2 & 32 \\ \hline 2 & 16 \\ \hline 2 & 8 \\ \hline 2 & 4 \\ \hline 2 & 2 \\ \hline & 1 \end{array}$$

$2(4)^{n-1} = 512$

$2(2^2)^{n-1} = 2^9$

$$2^{2n-1} = 2^9 \qquad \left(\because a^m \times a^n = a^{m+n}\right)$$

$2n - 1 = 9$ $\left(\because a^m = a^n \Rightarrow m = n\right)$

$2n = 9 + 1$

$n = \frac{10}{2} = 5$

$\therefore n = 5$

512 is the 5th term of the given G.P.

13. $\sqrt{3}, 3, 3\sqrt{3}........is\, 729?$

Sol: Given G.P. is $\sqrt{3}, 3, 3\sqrt{3}........is\, 729$

$a = \sqrt{3}$

$r = \frac{3}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{3\sqrt{3}}{3} = \sqrt{3}$

$$\begin{array}{r|l} 3 & 729 \\ \hline 3 & 243 \\ \hline 3 & 81 \\ \hline 3 & 27 \\ \hline 3 & 9 \\ \hline 3 & 3 \\ \hline & 1 \end{array}$$

$a_n = 729$

$a_n = a.r^{n-1} = 729$

$\sqrt{3}.(\sqrt{3})^{n-1} = 729$

$3^{\frac{1}{2}}.3^{\frac{n-1}{2}} = 3^6$

$3^{\frac{1}{2}+\frac{n-1}{2}} = 3^6$ $\left(\because a^m \times a^n = a^{m+n}\right)$

$3^{\frac{1+n-1}{2}} = 3^6$

$3^{\frac{n}{2}} = 3^6$ $\qquad (\because a^m = a^n \Rightarrow m = n)$

$\frac{n}{2} = 6$

$n = 6 \times 2$

$\therefore n = 12$

$\therefore 729$ is the 12^{th} term of the given G.P.

14. In a nursery, there are 17 rose plants in the first row, 14 in the second row, 11 in the third row and so on. If there are 2 rose plants in the last row, find how many rows of rose plants are there in the nursery.

Sol: Number of plants in first row = 17

Number of plants in second row = 14

Number of plants in third row = 11

$\therefore$ The series formed as 17, 14, 11, 8, 5, 2; the term are in A.P.

Here a = 17, d = 14 – 17 = - 3

$a_n = 2$

$a_n = a + (n - 1) d = 2$

$17 + (n - 1)(-3) = 2$

$17 - 3n + 3 = 2$

$20 - 3n = 2$

$3n = 20 - 2$

$3n = 18$

$$n = \frac{18}{3}$$

$\therefore$ n = 6

$\therefore$ There are 6 rows in the nursery.

15. Which term of the sequence -1, 3, 7, 11 ……. is 95?

Sol: Let the A.P. -1, 3, 7, 11…… 95

a = -1; d = 3 – (- 1) = 3 + 1 = 4; a_n = 95

a + (n - 1) d = 95

-1 + (n -1) (4) = 95

-1 + 4n – 4 = 95

4n – 4 = 95 + 1

4n – 4 = 96

4n = 96 + 4

4n = 100

$$n = \frac{100}{4} = 25$$

$\therefore 25^{th}$ term = 95.

16. A sum of Rs. 280 is to be used to award four prizes. If each prize after the first is Rs. 20 less than its preceding prize. Find the value of each of the prizes.

Sol: The value of prizes form an A.P

$\therefore$ In A.P. d = -20

S_n = 280

n = 4

$$\frac{n}{2}\left[2a+(n-1)d\right]=280$$

$$\frac{4}{2}\left[2a+(4-1)(-20)\right]=280$$

2[2a – 60] = 280

$2a - 60 = \frac{280}{2}$

2a – 60 = 140

2a = 140 + 60

2a = 200

$$a=\frac{200}{2}$$

$\therefore$ a = 100

$\therefore$ The value of each of the prizes = Rs 100, Rs 80, Rs 60, Rs 40.

17. If the 8th term of an A.P. is 31 and the 15th term is 16 more than the 11th term, find the A.P.

Sol: In an A.P. $a_8 = 31 \Rightarrow a_8 = a + 7d = 31$

$a_{15} = 16 + a_{11} \Rightarrow a + 14d = 16 + a + 10d$

14d – 10d = 16 + a – a

4 d = 16

$$d=\frac{16}{4}=4$$

a + 7d = 31 and d = 4

a + 7(4) = 31

$a + 28 = 31$

$a = 31 - 28$

$\therefore\ a = 3$

$\therefore$ A.P. is 3, 7, 11, 15, 19 ………..

18. Define Arithmetic progression and Geometric progression.

Sol: **Arithmetic Progression:** An arithmetic progression (AP) is a list of numbers in which each term is obtained by adding a fixed number ‘d’ to the preceding term, except the first term. The fixed number ‘d’ is called the common difference.

Geometric Progression: A geometric progression (G.P) is a list of numbers in which each term is obtained by multiplying preceding term with a fixed number ‘r’ except first term. This fixed number is called common ratio (r).

4 Mark Questions

1. If the 3rd & the 9th terms of an A.P. are 4 and -8 respectively. Which term of this AP is zero?

Sol: $a_3 = 4$, $a_9 = -8$

$a_3 = a + 2d = 4$ ---------- (1)

$a_9 = a + 8d = -8$--------- (2)

(2) – (1) we get

$$\begin{array}{r} a + 8d = -8 \\ a + 2d = 4 \\ \underline{-\quad -\qquad -} \\ 6d = -12 \end{array}$$

$$d = \frac{-12}{-6}$$

$d = -2$

Substitute $d = -2$ in the following equations

$a_4 = a_3 + d = 4 + (-2) = 4 - 2 = 2$

$a_5 = a_4 + d = 2 + (-2) = 2 - 2 = 0$

$\therefore 5^{th}$ term of the A.P becomes zero.

2. Find the 20th term from the end of A.P: 3, 8, 13 ……. 253

Sol: $a = 3$, $d = a_2 - a_1 = 8 - 3 = 5$, $a_n = 253$

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

$253 = 3 + (n - 1) (5)$

$253 - 3 = (n - 1) 5$

$$\frac{250}{5} = n - 1$$

n – 1 = 50

n = 51

$\therefore$ The 20^{th} term from the other end would be n – r + 1 = 51 – 20 + 1

= 32.

a_{32} = a + 31d

= 3 + 31(5)

= 3 + 155

= 158

The 20^{th} term is 158.

3. The sum of the 4^{th} and 8^{th} terms of an A.P. is 24 and the sum of the 6^{th} and 10^{th} term is 44. Find the first three terms of the A.P.

Sol: $4^{th} + 8^{th} = 24$

$\Rightarrow$ (a + 3d) + (a + 7d) = 24

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

$\Rightarrow$ 2a + 10d = 24

$\Rightarrow$ 2 (a + 5d) = 24

$$\Rightarrow (a + 5d) = \frac{24}{2}$$

$\therefore$ a + 5d = 12 ………. (1)

$6^{th} + 10^{th} = 44$

$\Rightarrow$ (a + 5d) + (a + 9d) = 44

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

$\Rightarrow$ 2a + 14d = 44

$\Rightarrow$ 2 (a + 7d) = 44

$\Rightarrow a + 7d = \frac{44}{2}$

$\therefore$ a + 7d = 22---------- (2)

$$
\begin{array}{rl}
(2) - (1) = & a + 7d = 22 \\
 & a + 5d = 12 \\
 & \underline{-\quad -\qquad -\quad} \\
 & \quad 2d = 10
\end{array}
$$

$d = \frac{10}{2}$

$\therefore$ d = 5.

Substitute d = 5 in eq (1)

We get, a + 5(5) = 12

$\Rightarrow$ a + 25 = 12

$\Rightarrow$ a = 12 – 25

$\Rightarrow$ a = - 13

$\therefore$ The first three terms of A.P are

a_1 = a = - 13

a_2 = a + d = -13 + 5 = - 8

a_3 = a + 2d = -13 + 2 (5) = -13 + 10 = -3.

4. Subba rao started work in 1995 at an annual salary of Rs 5000 and received an increment of Rs 200 each year. In which year did his income reach Rs 7000?

Sol:

Year	1995	1996	1997	1998	1999
Subba rao salary	5000	5200	5400	5600	5800

5000, 5200, 5400, 5600, 5800………… is in A.P.

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

$= 5000 + (n - 1)(200) = 7000$

$= 5000 + 200n - 200 = 7000$

$= 200n + 4800 = 7000$

$= 200n \quad = 7000 - 4800$

$= 200n = 2200$

$$n = \frac{2200}{200}$$

$\therefore n = 11.$

$\therefore$ The 11^{th} is 7000.

$\therefore$ In the year 2005 his income reaches to Rs 7000.

5. Given $a = 2$, $d = 8$, $S_n = 90$. Find n and a_n.

Sol: $a_n = a + (n - 1)\, d$

$= 2 + (n - 1)\, 8$

$= 2 + 8n - 8$

$= 8n - 6$

$a = 2$, $d = 8$, $S_n = 90$

$$S_n = \frac{n}{2}\left[2a + (n-1)d\right] = 90$$

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

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

$\Rightarrow n\,[4 + 8n - 8] = 90 \times 2$

$\Rightarrow 4n + 8n^2 - 8n = 90 \times 2$

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

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

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

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

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

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

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

$n - 5 = 0 \qquad 2n + 9 = 0$

$n = 5 \qquad 2n = -9$

$$n = \frac{-9}{2}$$

But we cannot take negative values so, $n = 5$

$\therefore a_5 = a + 4d = 2 + 4\ (8)$

$= 2 + 32 = 34.$

$\therefore n = 5$ and $a_5 = 34.$

6. If the sum of first 7 terms of an A.P is 49 and that of 17 terms is 289, find the sum of first n terms.

Sol: The sum of first 7 terms of an A.P = 7.

$S_n = \frac{n}{2}\left[2a+(n-1)d\right]$, where $S_n = 49$

n = 7, then $\Rightarrow 49 = \frac{7}{2}\left[2a+(7-1)d\right]$

$\Rightarrow 49 \times \frac{2}{7} = 2a + 6d$

$\Rightarrow 14 = 2a + 6d$

$\Rightarrow 14 = 2(a + 3d)$

$\Rightarrow a + 3d == \frac{14}{2} = 7$

$\therefore a + 3d = 7$ -------- (1)

And the sum of 17 terms is 289,

$S_n = \frac{n}{2}\left[2a+(n-1)d\right]$, $S_n = 289$, n = 17

Then $289 = \frac{17}{2}\left[2a+(17-1)d\right]$

$\Rightarrow 289 \times \frac{2}{17} = 2a + 16d$

$\Rightarrow 34 = 2a + 16d$

$$\Rightarrow 34 = 2(a+8d) \Rightarrow a+8d = \frac{34}{2} = 17$$

a + 8d = 17 ------- (2)

(1)(2) by solving

$$\begin{array}{r} a + 8d = 17 \\ a + 3d = 7 \\ - \quad - \quad\quad - \\ \hline 5d = 10 \end{array}$$

$$d = \frac{10}{5}$$

$\therefore$ d = 2

Substitute d = 2 in eq(1), we get

a + 3d = 7 $\Rightarrow$ a + 3 × 2 = 7 $\Rightarrow$ a + 6 = 7

$\Rightarrow$ a = 7 – 6

$\therefore$ a = 1

The first ‘n’ terms sum $S_n = \frac{n}{2}[2a+(n-1)d]$

a = 1, d = 2, then on substituting, we get

$$S_n = \frac{n}{2}[2.1+(n-1)2]$$

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

$$= \frac{n}{2} \times 2n = n^2$$

$S_n = n^2$

$\therefore$ The sum of first ‘n’ terms $(S_n) = n^2$.

7. If the sum of the first n terms of an AP is $4n - n^2$, what is the first term (remember the first term is S_1)? What is the sum of first two terms? What is the second term? Similarly, find the 3^{rd}, the 10^{th} and the nth terms.

Sol: The sum of the first 'n' terms of an A.P is $4n - n^2$

First term $a_1 = S_1 = 4 \times 1 - 1^2 = 4 - 1 = 3 \qquad (\because n = 1)$

First sum of the two terms $= 4 \times 2 - 2^2 = 8 - 4 = 4$

$S_3 = 4 \times 3 - 3^2 = 12 - 9 = 3 \qquad a_2 = S_2 - S_1 = 4 - 3 = 1$

$\therefore$ Third term $(a_3) = S_3 - S_2 = 3 - 4 = -1$

$S_{10} = 4 \times 10 - 10^2 = 40 - 100 = -60$

$S_9 = 4 \times 9 - 9^2 = 36 - 31 = -45$

Tenth term $(a_{10}) = S_{10} - S_9 = -60 - (-45) = -60 + 45 = 15$

$S_n = 4n - n^2$

$S_{n-1} = 4(n - 1) - (n - 1)^2$

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

$= -n^2 + 6n - 5$

The nth term $a_n = S_n - S_{n-1}$

$\Rightarrow a_n = 4n - n^2 - (-n^2 + 6n - 5)$

$= 4n - n^2 + n^2 - 6n + 5$

$= 5 - 2n$

$\therefore$ $S_1 = 3$, $S_2 = 4$, $a_2 = 1$, $a_3 = -1$, $a_{10} = -15$, $a_n = 5 - 2n$.

8. A sum of Rs 700 is to be used to give seven cash prizes to students of a school for their overall academic performance. If each prize is Rs 20 less than it's preceding prize, find the value of each of the prizes.

Sol: First term = Rs a

Each price is Rs 20 less than it's preceding prize, then the remaining prize of gift (a - 20), (a - 40) ----------- (a - 120), then

a, (a - 20), (a - 40) ---------- (a - 120) forms an A.P

so, $S_n = \frac{n}{2}[a + a_n]$. Here $S_n = 700$, n = 7, a = a , $a_n = a - 120$, on substituting these values we get

$$700 = \frac{7}{2}[a + a - 120]$$

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

$$200 = 2a - 120$$

$$320 = 2a$$

$$a = \frac{320}{2}$$

$$\therefore \ a = 160$$

$\therefore$ Each value of the prize Rs 160, Rs 140 , Rs 120, Rs 100, Rs 80, Rs 60, Rs 40.

9. The number of bacteria in a certain culture triples every hour if there were 50 bacteria present in the culture originally. Then, what would be number of bacteria in fifth, tenth hour.

Sol: The no of bacteria in a culture triples every hour.

$\therefore$ No of bacteria in first hour = 50

No of bacteria in second hour = 3 × 50 = 150

No of bacteria in third hour = 3 × 150 = 450

$\therefore$ 50, 150, 450 ….. would forms an G.P.

First term (a) = 50

Common ratio(r) = $\frac{t_2}{t_1} = \frac{150}{50} = 3$

nth term $a_n = ar^{n-1}$

No of bacteria in 5^{th} hour = $50 \times 3^{5-1} = 50 \times 81 = 4050$

No of bacteria in 10^{th} hour = $50 \times 3^{10-1} = 50 \times 19683$

$= 984150$

$\therefore$ 3^{rd}, 5^{th}, 10^{th} hours of bacteria number = 450, 4050, 984150.

10. The 4^{th} term of a G.P is $\frac{2}{3}$ the seventh term is $\frac{16}{81}$. Find the Geometric series.

Sol: The 4^{th} term of G.P $= \frac{2}{3}$, and the seventh term is $\frac{16}{81}$.

i.e. $ar^3 = \frac{2}{3} \longrightarrow (1)$

$ar^6 = \frac{16}{81} \longrightarrow (2)$

$\frac{(2)}{(1)}$,then we get

$$\frac{ar^6}{ar^3}=\frac{\frac{16}{81}}{\frac{2}{3}}$$

$$\Rightarrow r^3=\frac{8}{27}$$

$$\Rightarrow r^3=\left(\frac{2}{3}\right)^3$$

$$\therefore r=\frac{2}{3}$$

Now substitute $r=\frac{2}{3}$ in eq(1), we get

$$a.\left(\frac{2}{3}\right)^3=\frac{2}{3}\Rightarrow a\times\frac{8}{27}=\frac{2}{3}$$

$$\therefore a=\frac{9}{4},r=\frac{2}{3}$$

Then A.P. a, ar, ar^2, ar^3,…….

$$\frac{9}{4},\frac{9}{4}\times\frac{2}{3},\frac{9}{4}\times\frac{2^2}{3^2},\frac{9}{4}\times\frac{2^3}{3^3}..........$$

$$\Rightarrow\frac{9}{4},\frac{3}{2},1,\frac{2}{3},..........$$

11. If the geometric progressions 162, 54, 18 ……… and $\frac{2}{81},\frac{2}{27},\frac{2}{9},..........$ have their nth term equal. Find its value of n?

Sol: 162, 54, 18 ………

Here a = 162, $r=\frac{a_2}{a_1}=\frac{54}{162}=\frac{1}{3}$

The n^{th} term $= ar^{n-1} = 162\left(\frac{1}{3}\right)^{n-1}$ ....(1)

$$\frac{2}{81},\frac{2}{27},\frac{2}{9},..........$$

Here $a=\frac{2}{81}, r=\frac{a_2}{a_1}=\frac{\frac{2}{27}}{\frac{2}{81}}=\frac{2}{27}\times\frac{81}{2}=3$

$$n^{th} term = a.r^{n-1} = \frac{2}{81}.(3)^{n-1} ....(2)$$

Given that n^{th} terms are equal

$$\Rightarrow 162\times\left(\frac{1}{3}\right)^{n-1}=\frac{2}{81}\times(3)^{n-1} \qquad (\because From (1) \& (2))$$

$$\Rightarrow 3^{n-1}\times3^{n-1}=162\times\frac{81}{2}$$

$$\Rightarrow 3^{n-1+n-1}=81\times81$$

$$\Rightarrow 3^{2n-2}=3^4\times3^4$$

$$\Rightarrow 3^{2n-2}=3^8 \qquad \left[a^m.a^n=a^{m+n}\right]$$

$\Rightarrow$ 2n – 2 = 8

[if the bases are equal, exponents are also equal]

2n = 8 + 2

$$n=\frac{10}{2}$$

$\therefore$ n = 5

$\therefore$ The 5^{th} terms of the two G.P. s are equal.

12. Find the 12th term of a G.P. whose 8th term is 192 and the common ratio is 2.

Sol: Given G.P $a_8 = 192$ & $r = 2$

$a_n = a.r^{n-1}$

$a_8 = a\,(2)^{8-1} = 192$

$$a.2^7 = 192 \Rightarrow a = \frac{192}{2^7} = \frac{192}{128} = \frac{12}{8} = \frac{3}{2}$$

$$\therefore a_{12} = a.r^{11} = \frac{3}{2} \times (2)^{11}$$

$= 3 \times 2^{10} = 3 \times 1024$

$= 3072.$

13. In an A.P 2nd, 3rd terms are 14 & 18 and find sum of first 51 terms?

Sol: **2nd term:**

$a + d = 14$ …….. (1)

3rd term:

$a + 2d = 18$ …….. (2)

$$\begin{array}{r} a + d = 14 \\ a + 2d = 18 \\ -\quad -\quad - \\ \hline -d = -4 \\ d = 4 \end{array}$$

Substitute $d = 4$ in eq (1)

$a + 4 = 14$

$a = 14 - 4$

$a = 10$

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

$$S_n = \frac{51}{2}\left[2(10) + (51-1)(4)\right]$$

$$= \frac{51}{2}\left[20 + (50)(4)\right]$$

$$= \frac{51}{2}[20 + 200]$$

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

$= 51 \times 110$

$=5610$

$\therefore$ The sum of first 51 term = 5610.

14. In an A.p, the sum of the ratio of the m and n terms in $m^2 : n^2$, then show that m^{th} term and n^{th} terms ratio is (2m- 1) : (2n – 1).

Sol: AP, first term = a

Common difference = d

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

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

Given $\frac{S_m}{S_n} = \frac{m^2}{n^2}$

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

[2a + (m - 1) d] n = [2a + (n -1)d] m

2a (n - m) = d [(n -1)m – (m -1)n]

2a(n -m) = d (n -m)

d = 2a

$$\frac{T_m}{T_n} = \frac{a + (m-1)2a}{a + (n-1)2a} = \frac{a + 2am - 2a}{a + 2an - 2a}$$

$$= \frac{2am - a}{2an - a} = \frac{a(2m-1)}{a(2n-1)}$$

$$\frac{T_m}{T_n} = \frac{2m-1}{2n-1}$$

15. The sum of n, 2n, 3n terms of an A.P are S_1, S_2, S_3 respectively prove that $S_3 = 3(S_2 - S_1)$

Sol: In an A.P. first term is a and the common difference is d.

$$S_1 = \frac{n}{2}\left[2a + (n-1)d\right] \longrightarrow (1)$$

$$S_2 = \frac{2n}{2}\left[2a + (2n-1)d\right] \longrightarrow (2)$$

$$S_3 = \frac{3n}{2}\left[2a + (3n-1)d\right] \longrightarrow (3)$$

$$S_2 - S_1 = \frac{2n}{2}\left[2a + (2n-1)d\right] - \frac{n}{2}\left[2a + (n-1)d\right]$$

$$S_2 - S_1 = \frac{n}{2}\left[2a + (3n-1)d\right]$$

$$3(S_2 - S_1) = \frac{3n}{2}\left[2a + (3n-1)d\right] = S_3$$

$S_3 = 3(S_2 - S_1)$

Multiple Choice Questions

1. The n^{th} term of G.P is $a_n = ar^{n-1}$ where 'r' represents [ ]

a) First term b) Common difference

c) Common ratio d) Radius

2. The n^{th} term of a G.P is $2(0.5)^{n-1}$ then r = [ ]

a) 5 b) $\frac{1}{7}$ c) $\frac{1}{3}$ d) 0.5

3. In the A.P 10, 7, 4 …. -62, then 11^{th} term from the last is …. [ ]

a) –40 b) –23 c) –32 d) 10

4. Which term of the G.P $\frac{1}{3}, \frac{1}{9}, \frac{1}{27} \ldots\ldots is \frac{1}{2187}?$ [ ]

a) 12 b) 8 c) 7 d) None

5. n – 1, n – 2, n – 3, …… a_n = …. [ ]

a) n b) 0 c) –1 d) n^2

6. In an A.P a = –7, d = 5 then a_{18} = …. [ ]

a) 71 b) 78 c) 87 d) 12

7. 2 + 3 + 4 + …. + 100 = …. [ ]

a) 5050 b) 5049 c) 5115 d) 1155

8. $-1, \frac{1}{4}, \frac{3}{2}, \ldots. s_{81} = \ldots.$ [ ]

a) 3418 b) 8912 c) 3963 d) 3969

9. In G.P, 1^{st} term is 2, Q common ratio is –3 then 7^{th} term is [ ]

a) 1458 b) –1458 c) 729 d) –729

10. **1, –2, 4, –8, …. is a …. Progression** **[ ]**

a) A.P b) G.P c) Both d) None of these

11. **Common difference in** $\frac{1}{2}, 1, \frac{3}{2}......$ **[ ]**

a) $\frac{-1}{2}$ b) $\frac{1}{2}$ c) 2 d) -2

12. $\sqrt{3}, 3, 3\sqrt{3}.......is\ a$ **[ ]**

a) A.P b) G.P

c) Harmonic progression d) Infinite progression

13. $a = \frac{1}{3}, d = \frac{4}{3}$**,the 8th term of an A.P is _____** **[ ]**

a) $\frac{7}{3}$ b) $\frac{29}{3}$ c) $\frac{29}{9}$ d) $\frac{29}{24}$

14. **Arithmetic progression in which the common difference is 3. If 2 is added to every term of the progression, then the common difference of new A.P.** **[ ]**

a) 5 b) 6 c) 3 d) 2

15. **In an A.P. first term is 8 common difference is 2, then which term becomes zero** **[ ]**

a) 6th term b) 7th term c) 4th term d) 5th term

16. **4, 8, 12, 16, ………. is ____ series** **[ ]**

a) Arithmetic b) Geometric

c) Middle d) Harmonic

17. **Next 3 terms in series 3, 1, -1, -3………** **[ ]**

a) -5, -7, -9 b) 5, 7, 9 c) 4, 5, 6 d) -9, -11, -13

18. **If x, x + 2 & x + 6 are the terms of G.P. then x __________** **[ ]**

a) 2 b) -4 c) 3 d) 7

19. **In G.P. $a_{p+q} = m$, $a_{p-q} = n$. Then a_p =** **[ ]**

a) m^2n b) $\frac{m}{n}$ c) $\sqrt{mn}$ d) $m\sqrt{n}$

20. **3 + 6 + 12 + 24 ……. Progression, the n^{th} term is ____** **[ ]**

a) 3.2^{n-1} b) -3.2^{n-1} c) 2^{n+1} d) 2.3^{n-1}

21. **$a_{12} = 37$, d = 3, then S_{12} = ________** **[ ]**

a) 264 b) 246 c) 4 d) 260

22. **In the garden, there are 23 roses in the first row, in the 2^{nd} row there are 19. At the last row there are 7 trees, how many rows of rose trees are there?** **[ ]**

a) 10 b) 9 c) 11 d) 7

23. **From 10 to 250, how many multiples of 4 are ____** **[ ]**

a) 40 b) 60 c) 45 d) 65

24. **The taxi takes Rs. 30 for 1 hour. After for each hour Rs. 10, for how much money can be paid & how it forms progression** **[ ]**

a) Geometric progressions b) Harmonic progression

c) Series Progressions d) Arithmetic progression

Key

1) C	**2)** D	**3)** C	**4)** C	**5)** B	**6)** B	**7)** B	**8)** D
9) A	**10)** B	**11)** B	**12)** B	**13)** B	**14)** C	**15)** D	**16)** A
17) A	**18)** A	**19)** C	**20)** A	**21)** B	**22)** B	**23)** B	**24)** D

Bit Blanks

1. The sum of first 20 odd numbers ____
2. 10, 7, 4, ….. a_{30} = ___________
3. 1 + 2 + 3 + 4 + …. + 100 = ______
4. In the G.P 25, –5, 1, $-\frac{1}{5}$ …. r = _________
5. The reciprocals of terms of G.P will form _______
6. If $-\frac{2}{7}$, x, $-\frac{7}{2}$ are in G.P. Then x = _______
7. 1 + 2 + 3 + …. + 10 = ___________
8. If a, b, c are in G.P, then $\frac{b}{a}$ = _________
9. $x, \frac{4x}{3}, \frac{5x}{3}, \ldots.. a_6 =$ _______
10. In a G.P a_4 =______________
11. $\frac{1}{1000}, \frac{1}{100}, \frac{1}{10}, 1$ are in __________
12. The 10th term from the end of the A.P; 4, 9, 14…… 254 is _________
13. In a G.P a_{n-1} = ________
14. In an A.P $s_n - s_{n-1}$ = _________
15. 1.2 + 2.3 + 3.4 + …. 5 terms = _________
16. In a series $a_n = \frac{n(n+3)}{n+2}, a_{17} =$ -------
17. $-3, -\frac{1}{2}, 2,$ …. A.P, the nth term ______________

18. $a_3 = 5$ & $a_7 = 9$, then find the A.P___________

19. The n^{th} term of the G.P $2(0.5)^{n-1}$, then the common ratio ___________

20. 4, –8, 16, –32 then find the common ratio is _________

21. The nth term $t_n = \frac{n}{n+1}$ then $t_4 =$ ______

22. In an A.P $l = 28$, $s_n = 144$ & total terms are 9, then the first term is _________

23. In an A.P 11^{th} term is 38 and 16^{th} term is 73, then common difference of A.P is ________

24. In a garden there are 32 rose flowers in first row and 29 flowers in 2^{nd} row, and 26 flowers in 3^{rd} row, then how many rose trees are there in the 6^{th} row is _______

25. –5, –1, 3, 7 …. Progression, then 6^{th} term is _________

26. In Arithmetic progression, the sum of n^{th} terms is $4n - n^2$, then first term is ______

Key

1) 400; 2) – 77; 3) 5050; 4) $\left(-\frac{1}{5}\right)$; 5) Geometric Progression;

6) ±1; 7) 55; 8) $\frac{c}{b}$; 9) $\frac{8x}{3}$; 10) ar^3;

11) G.P.; 12) 209; 13) ar^{n-2}; 14) a_n; 15) 70;

16) $\frac{340}{19}$; 17) $\frac{1}{2}(5n-11)$; 18) 3, 4, 5, 6, 7; 19) 0.5; 20) –2;

21) $\frac{4}{5}$; 22) 4; 23) 7; 24) 17; 25) 15; 26) 3.