

Wk.	Mo	Tu	We	Th	Fr	Sa	Su
14th	.	.	01	02	03	04	05
15th	06	07	08	09	10	11	12
16th	13	14	15	16	17	18	19
17th	20	21	22	23	24	25	26
18th	27	28	29	30	.	.	.

हरात्मक श्रृंखला (Harmonic progression (H.P))

30

MONDAY

जिन राशियों के व्युत्क्रम (reciprocal) समान्तर श्रृंखला में हों, वे हरात्मक श्रृंखला में कहलाती हैं। -

H.P श्रृंखला (series) :-

$$\frac{1}{2}, \frac{1}{4}, \frac{1}{6}, \frac{1}{8}, \dots$$

$$\frac{1}{3}, \frac{1}{6}, \frac{1}{9}, \frac{1}{12}, \dots$$

$$\frac{1}{a}, \frac{1}{a-d}, \frac{1}{a-2d}, \frac{1}{a-3d}, \dots$$

$$\frac{1}{a}, \frac{1}{a+d}, \frac{1}{a+2d}, \frac{1}{a+3d}, \dots$$

Case-1

Q. श्रृंखला $2, 5, 8, \dots$ का 14 वाँ पद ज्ञात कीजिए। (Find the 14th term of the series $2, 5, 8, \dots$).

Solution:- $2, 5, 8, \dots$ H.P

Notes

$2, 5, 8, \dots$ H.P

$$a = 2 \quad d = 5 - 2 = 3 \quad n = 14 \quad T_n = ?$$

TUESDAY

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

$$= 2 + (14-1)3$$

$$= 2 + 13 \times 3$$

$$= 2 + 39$$

$$= 41$$

According to H.P = $\frac{1}{41}$

Q. No. श्रृंखला $\frac{2}{9} + \frac{4}{17} + \frac{1}{4} + \dots$ का नववाँ पद
जान करी। (Find the ninth term of the series
 $\frac{2}{9} + \frac{4}{17} + \frac{1}{4} + \dots$)

Solution:- $\frac{2}{9} + \frac{4}{17} + \frac{1}{4} + \dots$ H.P

समजाएँ कि $\frac{9}{2}, 17, 4, \frac{1}{4}, \dots$ A.P

$$\therefore a = \frac{9}{2} \quad d = \frac{17-9}{2} = \frac{8}{2} = 4$$

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

Notes $= \frac{9}{2} + (9-1) \cdot 4$

$$= \frac{9}{2} + 32 = \frac{9+64}{2} = \frac{73}{2}$$

$$\frac{18-8}{4} = \frac{10}{4}$$

According to H.P = $\frac{4}{10} = \frac{2}{5}$

Case - II

Q: Find the H.P. whose 7th term is $\frac{1}{10}$ and 12th term is $\frac{1}{25}$.

(Find the H.P. whose 7th term is $\frac{1}{10}$ and 12th term is $\frac{1}{25}$ respectively.)

Solution:-

H.P. का 7वाँ पद = $\frac{1}{10}$

A.P. का 7वाँ पद = 10

H.P. का 12वाँ पद = $\frac{1}{25}$

Notes

H.P. का 12वाँ पद = 25

7 वाँ पद = 10

$$a + 6d = 10 \quad \text{--- (i)}$$

12 वाँ पद = 25

$$a + 11d = 25 \quad \text{--- (ii)}$$

समी. (ii) में (i) का मान रखने पर, तथा व्यर्थन पर,

$$d + 11d = 25$$

$$a + 6d = 10$$

$$5d = 15$$

$$d = \frac{15}{5} = 3$$

$$d = 3$$

$d = 3$ का मान समी. (i) में रखने पर,

$$a + 6d = 10$$

$$a + 6 \times 3 = 10$$

$$a = 10 - 18$$

$$= -8$$

इस प्रकार श्रृंखला = $\frac{1}{a}$, $\frac{1}{a+d}$, $\frac{1}{a+2d}$

$$= \frac{1}{-8}, \frac{1}{-8+3}, \frac{1}{-8+2 \times 3}$$

Case - III

1) श्रृंखला $\frac{1}{2}$ और $\frac{1}{5}$ के बीच 4 ह. माध्यों कात कीजिए।

Solution :- $a = 2$; $T_n = 5$; $n = 4 + 2$
 $= 6$

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

$$5 = 2 + (6-1)d$$

$$5 - 2 = 5d$$

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

$$T_1 = \frac{a}{a+d} = \frac{2}{2 + \frac{3}{5}} = \frac{10}{13} = \frac{5}{13}$$

$$T_2 = \frac{1}{a+2d} = \frac{1}{2 + 2 \times \frac{3}{5}} = \frac{1}{2 + \frac{6}{5}} = \frac{5}{16} = \frac{5}{16}$$

Notes $T_3 = \frac{1}{a+3d} = \frac{1}{2 + 3 \times \frac{3}{5}} = \frac{1}{2 + \frac{9}{5}} = \frac{5}{19} = \frac{5}{19}$

$$T_4 = \frac{1}{a+4d} = \frac{1}{2 + 4 \times \frac{3}{5}} = \frac{1}{2 + \frac{12}{5}} = \frac{5}{22} = \frac{5}{22}$$