Exercise 3A Harmonic series

Q1. Find the sequence whose n^{th} term is $\frac{1}{3n-2}$. Is this sequence an H.P.

$\frac{1}{3n-2}$ are in H.P

$3n-2$ are in A.P

$t_n = 3n-2$

$t_1 = 3\times1 - 2$ ($n=1$ रखने पर)

$= 3-2 = 1$

$t_2 = 3\times2 - 2$ ($n=2$ रखने पर)

$= 6-2 = 4$

$t_3 = 3\times3 - 2$ ($n=3$ रखने पर)

$= 9-2 = 7$

$t_4 = 3\times4 - 2$ ($n=4$ रखने पर)

$= 12-2 = 10$

1, 4, 7, 10, ... are in A.P

$1, \frac{1}{4}, \frac{1}{7}, \frac{1}{10}$, ... are in H.P Ans.

Q2. Find the forth term of the sequence $2, 2\frac{1}{2}, 3\frac{1}{3}$ ....

$2, \frac{5}{2}, \frac{10}{3}$, ... are in H.P

$\frac{1}{2}, \frac{2}{5}, \frac{3}{10}$, ... are in A.P

$a = \frac{1}{2}$, $d = \frac{2}{5} - \frac{1}{2} = \frac{4-5}{10} = -\frac{1}{10}$

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

$t_4 = \frac{1}{2} + (4-1) \times -\frac{1}{10}$

$= \frac{1}{2} - \frac{3}{10}$

$= \frac{5-3}{10} = \frac{2}{10} = \frac{1}{5}$

(Reciprocal) $t_4 = 5$ Ans.

Q.3. which term is $\left(-\frac{1}{26}\right)$ of progression $\frac{1}{10}, \frac{1}{8}, \frac{1}{6}, \frac{1}{4}$ ----?

~~$a = \frac{1}{10}$~~

$\frac{1}{10}, \frac{1}{8}, \frac{1}{6}, \frac{1}{4}$, ---- are in H.P

10, 8, 6, 4, ---- are in AP

$a = 10, d = -2$

$t_n = -26$ (Reciprocal)

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

$-26 = 10 + (n-1) \times -2$

$-26 = 10 - 2n + 2$

$2n = 12 + 26$

$n = \frac{38}{2} = 19$

19^{th} term hs.

4. Find the seventh term of the series $\frac{1}{3} + \frac{8}{23} + \frac{9}{11} + \cdots$

$\frac{1}{3} + \frac{8}{23} + \frac{9}{11} + \cdots$ are in H.P

$3 + \frac{23}{8} + \frac{11}{9} + \cdots$ are in A.P

$a = 3, \quad d = \frac{23}{8} - 3 = -\frac{1}{8}$

$n = 7$

$t_7 = 3 + (7-1)\times -\frac{7}{8}$

$= 3 + \frac{1}{8} - \frac{7}{8}$

$= \frac{24+1-7}{8}$

$= \frac{25-7}{8}$

$= \frac{18}{8}$

$= \frac{9}{4}$

Reciprocal

$\left(\frac{4}{9}\right)$ Ans.