

Infinite G.P

समन्य श्रेणी का योग (G.P)

$$S_{\infty} = \frac{a}{1-r}$$

Q.11. Find the sum of the series:

$$1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \dots \infty$$

$$a = 1, \quad r = \frac{1}{2}$$

$$S_{\infty} = \frac{a}{1-r}$$

$$= \frac{1}{1 - \frac{1}{2}} = \frac{1 \times 2}{2-1} = \frac{2}{1} = 2 \text{ Ans.}$$

Q.12. Find the sum of the series $1 + 3x + 9x^2 + 27x^3 + \dots$ to ∞ .

$$a = 1, \quad r = 3x$$

$$S_{\infty} = \frac{a}{1-r} = \frac{1}{1-3x} \text{ Ans.}$$

Q. 13. Find the sum of the series :

$$\frac{1}{5} + \frac{1}{7} + \frac{1}{5^2} + \frac{1}{7^2} + \dots \text{to } \infty$$

$$\text{SI} \quad \frac{1}{5} + \frac{1}{5^2} + \frac{1}{5^3} + \dots$$

$$a = \frac{1}{5}, \quad r = \left(\frac{1}{5}\right) \times 5 = \frac{1}{5}$$

$$\text{I } S_{\infty} = \frac{a}{1-r} = \frac{\frac{1}{5}}{1-\frac{1}{5}} = \frac{\frac{1}{5}}{\frac{5-1}{5}} = \frac{1}{5} \times \frac{5}{4} = \frac{1}{4}$$

$$\text{II} \quad \frac{1}{7} + \frac{1}{7^2} + \frac{1}{7^3} + \dots$$

$$a = \frac{1}{7}, \quad r = \frac{1}{7}$$

$$\text{D } S_{\infty} = \frac{a}{1-r} = \frac{\frac{1}{7}}{1-\frac{1}{7}} = \frac{\frac{1}{7}}{\frac{7-1}{7}} = \frac{1}{7} \times \frac{7}{6} = \frac{1}{6}$$

$$S_{\infty} = S_{\text{I}\infty} + S_{\text{II}\infty} \\ = \frac{1}{4} + \frac{1}{6}$$

$$= \frac{3+2}{12} = \frac{5}{12} \text{ Ans.}$$

Exercise-2D

3. Insert 8 terms between $\frac{8}{27}$ and $-5\frac{1}{6}$

$$\frac{8}{27}, U_1, U_2, U_3, U_4, U_5, U_6, \dots, -\frac{81}{6}$$

$$a = \frac{8}{27}, \quad n = 8, \quad U_n = -\frac{81}{6}$$

$$\therefore U_n = a \cdot r^{n-1}$$

$$\text{or, } -\frac{81}{6} = \frac{8}{27} \cdot r^{8-1}$$

$$\text{or, } \frac{-81 \times 27}{6 \times 8} = r^7$$

$$\text{or, } (r)^7 = -\left(\frac{3}{2}\right)^7$$

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

$$U_1 = a \cdot r = \frac{8}{27} \times -\frac{3}{2} = -\frac{4}{9}$$

$$U_2 = -\frac{4}{9} \times -\frac{3}{2} = \frac{2}{3}$$

$$U_3 = \frac{2}{3} \times -\frac{3}{2} = -1$$

$$U_4 = -1 \times -\frac{3}{2} = \frac{3}{2}$$

$$U_5 = \frac{3}{2} \times -\frac{3}{2} = -\frac{9}{4}$$

$$U_6 = -\frac{9}{4} \times -\frac{3}{2} = \frac{27}{8}$$