classmate

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Arithematic Progression :-

[$a \to 1^{st}$ term, $d \to$ common difference
$n \to$ no. of terms, $l \to$ last term (t_n)]

For term :- $t_n = a + (n-1)d$ $[d = t_2 - t_1 = t_3 - t_2 = \dots]$

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

Q1. Series :- 2, 5, 8, 11, 14, ...

Sol :- $a = t_1 = 2$

$t_2 = 5$

$\therefore d = t_2 - t_1$

$\Rightarrow d = 5 - 2 = 3$

- If 3 terms are in A.P :-

  $a-d,\ a,\ a+d = 3a$

- If 4 terms are in A.P :-

  $a-3d,\ a-d,\ a+d,\ a+3d$

- If 5 terms are in A.P :-

  $a-2d,\ a-d,\ a,\ a+d,\ a+2d$

For 3 numbers in A.P :-

$a,\ b,\ c$
$(t_1)\ (t_2)\ (t_3)$

We know,

$d = t_2 - t_1 = t_3 - t_2$

$\therefore b - a = c - b$

$\Rightarrow 2b = c + a$

$\Rightarrow \boxed{b = \frac{c+a}{2}}$

Geometric Progression :- $\left[\begin{array}{ll} a \to 1^{st} \text{ term} & r \to \text{common ratio} \\ n \to \text{no. of terms} & \end{array}\right]$

For term :- $t_n = ar^{n-1}$ $\left[r = \frac{t_2}{t_1} = \frac{t_3}{t_2} = \ldots\ldots \right]$

For Sum :- • $S_n = \frac{a(1-r^n)}{1-r}$, $r < 1$

• $S_n = \frac{a(r^n - 1)}{r-1}$, $r > 1$

• If 3 terms are in G.P :-

$\frac{a}{r}, a, ar$

• If 4 terms are in G.P :-

$\frac{a}{r^3}, \frac{a}{r}, ar, ar^3$

~~• If 5 terms are in G.P :-~~

For 3 numbers in G.P :-

$\underset{(t_1)}{a}, \underset{(t_2)}{b}, \underset{(t_3)}{c}$

We know,

$r = \frac{b}{a} = \frac{c}{b}$

$\therefore \frac{b}{a} = \frac{c}{b}$

$\Rightarrow \boxed{b^2 = ac}$

For infinite series G.P :- $\boxed{S_n = \frac{a}{1-r}}$

Q2 The product of three consecutive terms of a Geometric Progression is 343 and their sum is $\frac{91}{3}$. Find the three Terms

Sol:- Let the 3 terms be:- $\frac{a}{r}, a, ar$

A/Q,

$\left(\frac{a}{r}\right) a \cdot (a \cdot r) = 343$

$\Rightarrow a^3 = 343$

$\Rightarrow a = \sqrt[3]{343}$

$\Rightarrow \boxed{a = 7}$

1st term $= \frac{a}{r} = \frac{7}{3}$

2nd term $= a = 7$

3rd term $= ar = 7 \times 3 = 21$

$\frac{a}{r} + a + ar = \frac{91}{3}$

$\Rightarrow \frac{7}{r} + 7 + 7r = \frac{91}{3}$

$\Rightarrow \frac{7 + 7r^2}{r} = \frac{91 - 21}{3}$

$\Rightarrow 21 + 21r^2 = 70r$

$\Rightarrow 21r^2 - 70r + 21 = 0$

$\therefore r = 3$

Q3. Find the sum of infinite series $3 + 1 + \frac{1}{3} + \dots \infty$

Sol:- Here, $r = \frac{t_2}{t_1} = \frac{1}{3}$

We know, $S_n = \cancel{\frac{a}{1+r}}\ \frac{a}{1-r}$

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

$= \frac{3 \times 3}{2}$

$\Rightarrow S_n = \frac{9}{2}$