Chapter (11) → Geometric Progression (G.P.)

General G.P. is,

$$a, \quad ar, \quad ar^2, \quad \text{----}$$

where, a = first term

r = common ratio

$$\frac{t_2}{t_1} = \frac{t_3}{t_2} = \text{----} = r$$

n^{th} term of G.P. is,

$$t_n = ar^{n-1}$$ ← last term

Q. Find the 8^{th} term of G.P. :-

$5, \quad 10, \quad 20, \quad \text{----}$

$n = 8, \quad a = 5, \quad r = \frac{10}{5} = 2$

$$t_n = ar^{n-1}$$

$$t_8 = 5(2)^{8-1} = 5(2)^7$$

$$= 5 \times 128$$

$$= \boxed{640}$$

Q. If the first 2 consecutive terms of a G.P. are 125 & 25. find its 6th term.

$a = 125$, $ar = 25$

$r = \frac{25}{125} = \frac{1}{5}$

$n = 6$,

$t_n = ar^{n-1}$

$t_6 = 125\left(\frac{1}{5}\right)^{6-1} = 125 \times \frac{1}{5^5}$

$= \cancel{125} \times \frac{1}{\cancel{5^2} \times 25}$

$= \boxed{\frac{1}{25}}$

Q Find the G.P. whose 5^{th} term is 48 & 8^{th} term is 384.

$a_8 = a + 7d$
$a_{20} = a + 19d$
$a_{11} = a + 19d$
$a_4 = ar^3$
$a_{10} = ar^9$

$t_5 = 48 \Rightarrow ar^4 = 48$ —①

$t_8 = 384 \Rightarrow ar^7 = 384$ —②

② ÷ ①

$\frac{ar^7}{ar^4} = \frac{384}{48}^{\cancel{384}^{\cancel{192}^{\cancel{96}^{\cancel{48}^{8}}}}}$

$r^3 = 8 = 2^3$

$r = 2$

From ①, $ar^4 = 48 \Rightarrow a = \frac{48}{2^4} = 3$

∴ G.P is 3, 6, 12, 24. ----

Q. The first term of a G.P is 1. The sum of its third & fifth terms is 90. Find the common ratio.

$a = 1$, $t_3 + t_5 = 90$

$ar^2 + ar^4 = 90$

$r^4 + r^2 = 90$

$r^4 + r^2 - 90 = 0$

$r^4 + 10r^2 - 9r^2 - 90 = 0$

$r^2(r^2+10) - 9(r^2+10) = 0$

$(r^2-9)(r^2+10) = 0$

$r^2 + 10 \neq 0$, $r^2 - 9 = 0$

$r = \pm 3$

Common ratio is 3 or −3.

11(B)

(1) $a = -10$, $r = \frac{5/\sqrt{3}}{-10} = -\frac{5}{10\sqrt{3}} = -\frac{1}{2\sqrt{3}}$

$t_n = -\frac{5}{72}$

$ar^{n-1} = -\frac{5}{72}$

$-10^2\left(-\frac{1}{2\sqrt{3}}\right)^{n-1} = -\frac{5}{72}$

$$\left(-\frac{1}{2\sqrt{3}}\right)^{n-1} = \frac{1}{144} = \left(-\frac{1}{2\sqrt{3}}\right)^{4}$$

$$n - 1 = 4$$

$$n = 5 \longrightarrow 5^{th} \text{ term}$$

$$48 \quad 3 \quad 2 \quad 16 \times 3 \quad 16 \times 3 \times 3 = 144$$

H. W. $\longrightarrow$ Ex 11(A) & 11(B)