NCERT Question 11.9.3.15

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Question 11.9.3.15 : Given a GP with a = 729 and 7^{th} term 64, determine S_7

Solution :

The n^{th} term of a GP is given by a*r^{n-1} where a is the first term of the GP and r is the common difference.

The first term of the GP (a) = 729
The 7^{th} term is given by a*r^6
The seventh term is given as 64

$$\therefore 64 = 729 * (r^6)$$
$$\implies \left(\frac{64}{729}\right) = r^6$$
$$\implies \frac{2}{3} = r$$

The sum of n terms of a GP is given by :

$$S_n = \frac{a * (r^n - 1)}{r - 1}$$
$$\therefore S_7 = \frac{729 * \left(\left(\frac{2}{3}\right)^7 - 1\right)}{\frac{2}{3} - 1}$$
$$= \frac{729 * \left(1 - \left(\frac{128}{2187}\right)\right)}{1 - \frac{2}{3}}$$
$$= \frac{729 * \left(\frac{2187-128}{2187}\right)}{\frac{1}{3}}$$
$$= \frac{729 * \left(\frac{2059}{2187}\right)}{\frac{1}{3}}$$
$$= \frac{729 * 3 * 2059}{2187}$$
$$= 2059$$

Answer: The sum of the first 7 terms of the GP (S_7) is 2059