NCERT: 11.9.3.2

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QUESTION:

Find the 12^{th} term of a G.P. whose 8^{th} term is 192 and common ratio is 2.

SOLUTION:

General term can also be written as

$$x(n) = x(0)\, r^n u(n) \tag{1}$$

Now on Z-transforming, we get

$$X(z) = \sum_{-\infty}^{\infty} x(n)\, z^{-n} u(n) \tag{2}$$

On referring to **??**, we get

$$X(z) = \sum_{-\infty}^{\infty} x(0)\, r^n z^{-n} u(n) \tag{3}$$

$$\implies X(z) = x(0)\, \frac{r}{z-r} \tag{4}$$

Referring to Table **??**

$$r = 2 \tag{5}$$

$$\implies x(7) = 192 \tag{6}$$

$$\implies x(0)\, 2^7 = 192 \tag{7}$$

$$\implies 128 x(0) = 192 \tag{8}$$

$$\implies x(0) = \frac{3}{2} = 1.5 \tag{9}$$

The general term is written as

$$x(n) = 1.5 \times 2^n \tag{10}$$

On referring to (**??**) and Table **??**, we get

$$\boxed{X(z) = \frac{3}{z-2}} \quad \forall \; z > 2 \tag{11}$$

On referring to **??** for 12^{th} term, we get

$$x(11) = 1.5 \times 2^{11} = 3072 \tag{12}$$

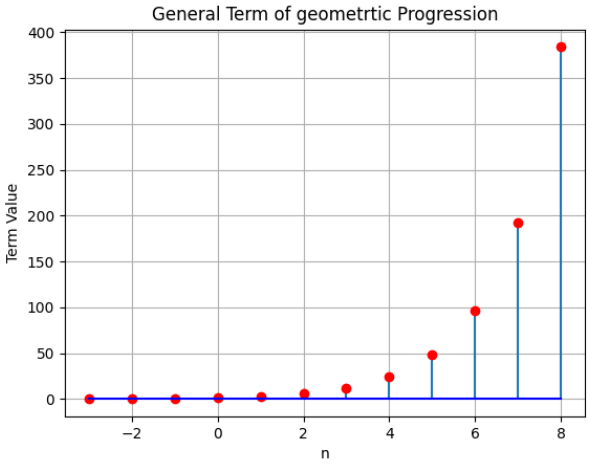

Fig. 1. Plot of the general term taken from Python3

Variable	Description	value
r	common ratio	2
$x(0)$	first term	1.5
$x(n)$	General term of sequence	None
$X(z)$	Z-Transform Equation	None

TABLE 1
VARIABLES USED AND THEIR DESCRIPTIONS