NCERT Discrete - 10.5.3.20

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Parameter	Value	Description
x(0)	5	First term
r	2	Common ratio
s(n)	315	Sum of terms
n	?	Value of n

TABLE 0
INPUT PARAMETERS

Question : 10.5.3.20 The sum of some terms of G.P. is 315 whose first term and the common ratio are 5 and 2, respectively. Find the last term and the number of terms.

Solution:

Given:

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

$$x(z) = \frac{x(0)}{1 - rz^{-1}} \tag{2}$$

$$S(z) = X(z)U(z) \tag{3}$$

$$S(z) = \frac{x(0)(\frac{r}{1-rz^{-1}} - \frac{1}{1-z^{-1}})}{r-1} \tag{4}$$

By contour integration:

$$s(n) = x(0)\left(\frac{r^{n+1} - 1}{r-1}\right)u(n) \tag{5}$$

From (5):

$$315 = 5(2^{n+1} - 1) \tag{6}$$

$$63 = 2^{n+1} - 1 \tag{7}$$

$$64 = 2^{n+1} \tag{8}$$

$$n = 5 \tag{9}$$

$$x(n) = x(0)r^n \tag{10}$$

$$x(5) = 5\left(2^5\right) \tag{11}$$

$$= 160 \tag{12}$$

Therefore, the number of terms is 6, and the last term is 160.

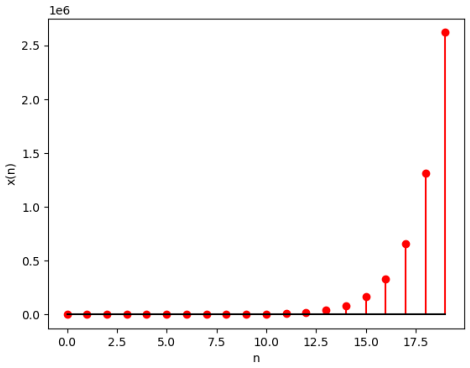

Fig. 0. Stem plot of GP