

NCERT Discrete - 11.9.3.11

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Question 11.9.3.11: Evaluate $\sum_{k=1}^{11} (2 + 3^k)$.

Solution:

variable	value	description
$x(0)$	3	first term of the geometric progression
r	3	common ratio of the geometric progression
$x(n)$	$3^n u(n)$	n^{th} term of the geometric progression
$y(n)$	$\frac{x(0)(r^{n+1}-1)}{r-1} u(n)$	Sum of the n term of the geometric progression

TABLE 0
INPUT PARAMETERS

$$\sum_{k=1}^{11} (2 + 3^k) = 2(n+1) + \sum_{n=0}^{10} 3^{n+1} = x_o(n) \quad (1)$$

(2)

Applying Z-transform:

$$X(z) = x(0) \left(\frac{1}{1 - rz^{-1}} \right), \quad |rz^{-1}| < 1 \quad (3)$$

$$y(n) = x(n) * u(n) \quad (4)$$

$$Y(z) = X(z) U(z) \quad (5)$$

$$= 3 \left(\frac{1}{1 - 3z^{-1}} \right) \left(\frac{1}{1 - z^{-1}} \right), \quad |z| > 1 \quad (6)$$

$$= \left(\frac{3}{2} \right) \left(\left(\frac{3}{1 - 3z^{-1}} \right) - \left(\frac{1}{1 - z^{-1}} \right) \right) \quad (7)$$

$$\frac{1}{1 - rz^{-1}} \xleftrightarrow{Z^{-1}} r^n u(n), \quad |z| > r \quad (8)$$

$$y(n) = 3 \left(\frac{3^{n+1} - 1}{3 - 1} \right) u(n) \quad (9)$$

$$y(n) = \left(\frac{3^{12} - 1}{2} \right) \quad (10)$$

$$y_o(n) = 2(n+1) + y(n) \quad (11)$$

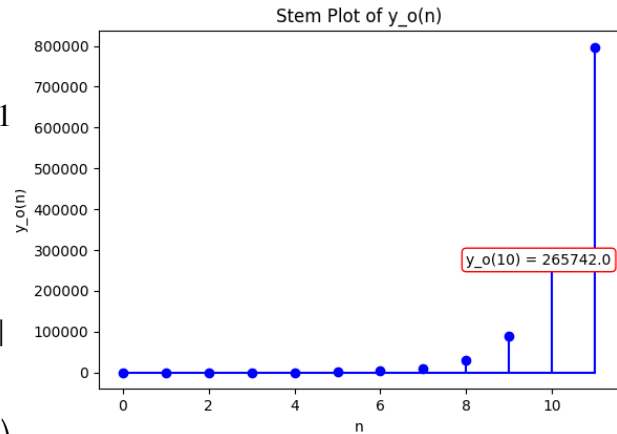


Fig. 0. stem plot