

# NCERT 11.9.2 Q7

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**Question: Find the sum of  $n$  terms of the A.P. whose  $k$ th term is  $5k + 1$ .**

Symbol	Value	Parameter
$x(0)$	1	First Term
$x(n)$	$(5n + 1)u(n)$	$k$ th Term
$d$	5	Common Difference

TABLE I  
GIVEN PARAMETERS

Apply the Z-transform to  $x[n]$ :

$$X[z] = \frac{5z^{-1}}{[1 - z^{-1}]^2} + \frac{1}{[1 - z^{-1}]} \quad |z| > 1 \quad (1)$$

Sum of First  $n$  Terms:

$$y[n] = x[n] * u[n] \quad (2)$$

Applying Z transform on both sides:

$$Y[z] = X[z] U[z] \quad (3)$$

$$= \frac{1}{[1 - z^{-1}]^2} + \frac{5}{2} \cdot \frac{2z^{-1}}{[1 - z^{-1}]^3} \quad (4)$$

Now we can compare the above pairs as;

$$nu[n] \xleftrightarrow{Z} \frac{z^{-1}}{(1 - z^{-1})^2} \quad (5)$$

$$u[n] \xleftrightarrow{Z} \frac{1}{(1 - z^{-1})} \quad (6)$$

$$n[n - 1]u[n] \xleftrightarrow{Z} \frac{2z^{-1}}{(1 - z^{-1})^3} \quad (7)$$

On referring the above equations and comparing, we can obtain the Z transform inverse as follows:

$$y[n] = [n + 1]u[n] + \frac{5}{2}n[n - 1]u[n] \quad (8)$$

Therefore we have got the sum of  $n$  terms as:

$$y[n] = \left[ n + 1 + \frac{5}{2}n[n - 1] \right] u[n] \quad (9)$$

The stem plot is given as

