NCERT 11.9.2 Q7

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

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

TABLE I
GIVEN PARAMETERS

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

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

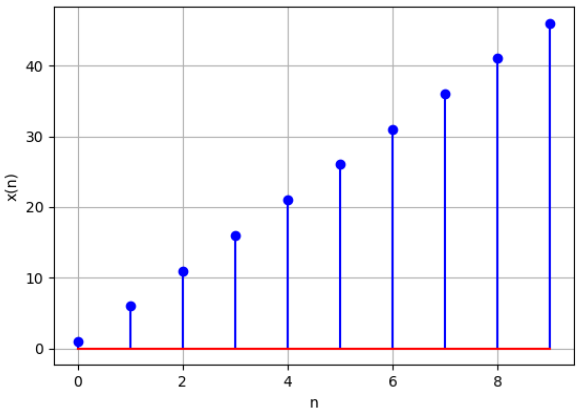
Sum of First n Terms:

$$y[n] = x[n] * u[n] \tag{2}$$

Applying Z transform on both sides:

$$Y[z] = X[z]\,U[z] \tag{3}$$

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



Now we can compare the above pairs as;

$$nu[n] \overset{Z}{\leftrightarrow} \frac{z^{-1}}{(1-z^{-1})^2} \tag{5}$$

$$u[n] \overset{Z}{\leftrightarrow} \frac{1}{(1-z^{-1})} \tag{6}$$

$$n[n-1]\,u[n] \overset{Z}{\leftrightarrow} \frac{2z^{-1}}{(1-z^{-1})^3} \tag{7}$$

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

$$y[n] = [n+1]\,u[n] + \frac{5}{2}n[n-1]\,u[n] \tag{8}$$

Therefore we have got the sum of n terms as:

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

The stem plot is given as