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## Assignment-1

### EE:1205 Signals and Systems Indian Institute of Technology, Hyderabad

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### I. QUESTION:

Ramkali saved Rs 5 in the first week of a year and then increased her weekly savings by Rs 1.75. If in the *n*th week, her weekly savings become Rs 20.75, find *n*.

### **II. SOLUTION:**

Parameter	Value	Description
x(0)	5	First term of AP
d	1.75	Common difference of AP
x(n)	20.75	<i>n</i> <sup>th</sup> term of AP

TABLE 0 Parameter List

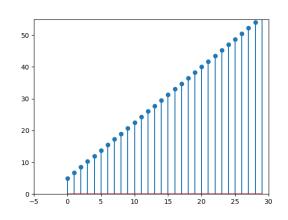


Fig. 0. Plot of x(n) = 5 + 1.75n

$$x(n) = x(0) + (n)(d)$$
 (1)

$$20.75 = 5 + (n)(1.75) \tag{2}$$

$$\implies 15.75 = (n)(1.75)$$
 (3)

$$\implies n = \frac{15.75}{1.75} \tag{4}$$

$$\implies n = 9$$
 (5)

Hence, n is 9.

$$x(n) = 5 + 1.75(n) \tag{6}$$

The Z-transform of a sequence x(n) is given by:

$$X(z) = \sum_{n=1}^{\infty} (5 + 1.75n)z^{-n}$$
 (7)

$$X(z) = \sum_{n=1}^{\infty} 5z^{-n} + \sum_{n=1}^{\infty} 1.75nz^{-n}$$
 (8)

$$X(z) = 5U(z) + 1.75(z)\frac{d}{dz}U(z)$$
 (9)

$$X(z) = \frac{5z^{-1}}{1 - z^{-1}} + \frac{1.75z^{-1}}{(1 - z^{-1})^2}$$
 (10)

$$f(n) = \begin{cases} 5 + 1.75n, & \text{if } n \ge 0 \\ 0, & \text{if } n < 0 \end{cases}$$
 (11)

Given that n > 0,

$$X(z) = \sum_{n=1}^{\infty} (5 + 1.75n) \cdot z^{-n}$$
 (12)

ROC: |z| > 1