

# Discrete Assignment-11.9.1-11

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## Problem Statement

Write the first five terms in the sequence:

$$a_0 = 3 \quad (1)$$

$$a_n = 3a_{n-1} + 2 \quad \text{for } n > 0 \quad (2)$$

## Solution

Table 1: Input Parameters: First Term and General Formula

Term	Value
$x(0)$	3
$x(n)$	$3x(n-1) + 2$

So, the first 5 terms of the sequence are 3, 11, 35, 107, 323.

## Difference Equation and Z-transform

$x(n) = 3x(n-1) + 2$ . The Z-transform of this difference equation is

$$X(z) = \frac{2}{(1 - z^{-1})(1 - 3z^{-1})} \quad (3)$$

$$= \frac{A_1}{1 - z^{-1}} + \frac{A_2}{1 - 3z^{-1}} \quad (4)$$

To find the values of  $A_1$  and  $A_2$ , multiply through by the common denominator:

$$2 = A_1(1 - 3z^{-1}) + A_2(1 - z^{-1}) \quad (5)$$

Equating coefficients, solve for  $A_1$  and  $A_2$ :

$$A_1 = -1 \quad (6)$$

$$A_2 = 3 \quad (7)$$

Substitute these values back into the modified partial fraction decomposition:

$$X(z) = -\frac{1}{1 - z^{-1}} + \frac{3}{1 - 3z^{-1}}$$

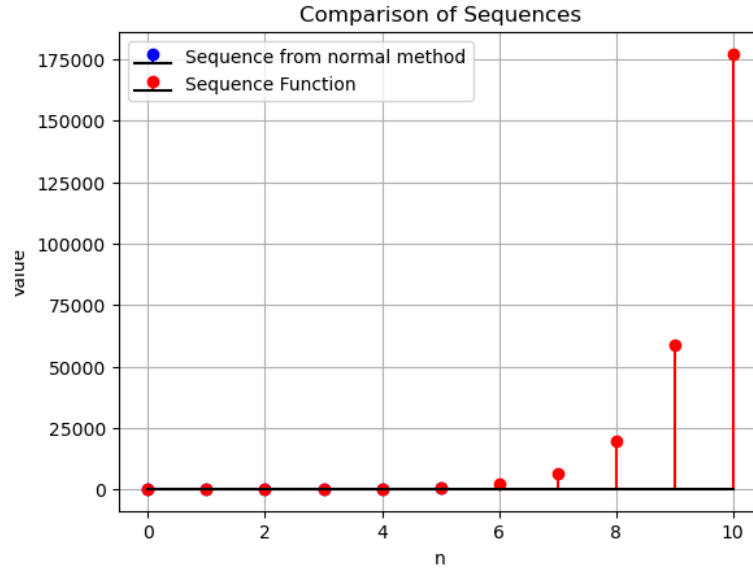


Figure 1: Comparison of Sequences