Discrete Assignment

EE:1205 Signals and Systems
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I. Question 10.5.2.13

How many 3 digit numbers are divisible by 7?

II. Solution

TABLE 1
Input Parameters

Parameter	Used to denote	Values
$x(0)$	First Term	$x(0) = 105$
d	Common difference of A.P	$d = 7$

Three digit numbers which are divisible by 7 are $105, 112, 119, \ldots, 994$, which form an arithmetic progression (A.P). The number of terms in the AP x(n) is given by:

$$n = \frac{x(n) - x(0)}{d} + 1 \tag{1}$$

$$a_n = a_1 + (n-1)d \tag{2}$$

$$X(z) = \frac{x[0]}{1 - z^{-1}} + d\frac{z^{-1}}{(1 - z^{-1})^2} \quad |z| > 1 \tag{3}$$

$$x(n) = (105 + (n)\,7)\,u(n) \tag{4}$$

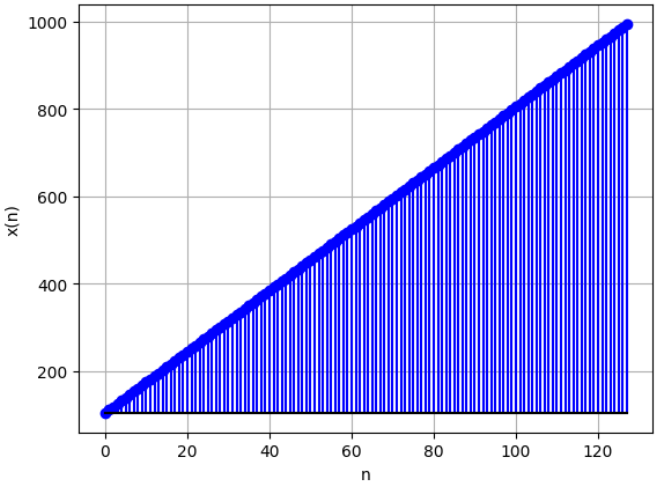

Fig. 1. Plot of $x(n)$

Using the values in Table 1 :

$$k = \frac{994 - 105}{7} + 1 = 128 \tag{5}$$

Taking z transform of (4) :

$$X(z) = \frac{105 - 98z^{-1}}{(1 - z^{-1})^2} \quad |z| > 1 \tag{6}$$