

NCERT Discrete - 11.5.9.2

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Question: The sum of three numbers in an arithmetic progression (AP) is 24 and the product of those three numbers is 440, find the values of the three numbers.

Solution: The following information is provided in the question:

Parameter	Value	Description
$x(n)$	$(x(0) + n \cdot d) u(n)$	$(n + 1)$ th term
d	3	common difference
$x(0) + x(1) + x(2)$	24	sum of the terms
$x(0) \cdot x(1) \cdot x(2)$	440	product of terms

TABLE 0
PARAMETERS

Let the three numbers in the arithmetic progression be denoted as $x(0)$, $x(1)$, and $x(2)$.

From Table 0

$$x(0) + x(1) + x(2) = 24 \quad (1)$$

$$(x(1) - d) + x(1) + (x(1) + d) = 24 \quad (2)$$

$$\Rightarrow 3x(1) = 24 \quad (3)$$

$$x(1) = 8 \quad (4)$$

$$x(0) \cdot x(1) \cdot x(2) = 440 \quad (5)$$

$$(8 - d) \cdot (8) \cdot (8 + d) = 440 \quad (6)$$

$$(8 - d) \cdot (8 + d) = 55 \quad (7)$$

$$64 - d^2 = 55 \quad (8)$$

$$\Rightarrow d = 3 \quad (9)$$

$$\Rightarrow x(0) = 5 \quad (10)$$

$$x(n) = (5 + 3n) u(n) \quad (11)$$

From equation (??):

$$X(z) = \frac{5 - 8z^{-1}}{(1 - z^{-1})^2}; \quad |z| > |1| \quad (12)$$

Therefore, the required three numbers in AP are 5, 8, and 11.

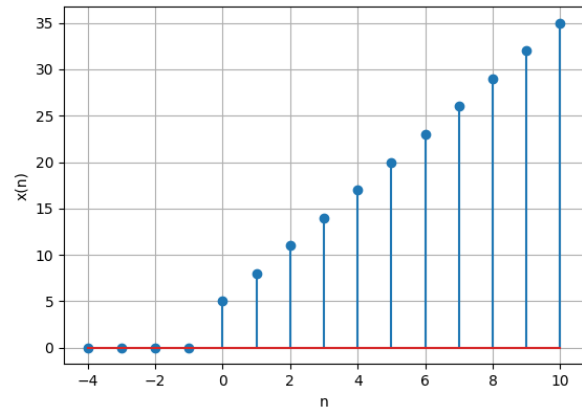


Fig. 0. stem plots of $x(n)$