

EE23BTECH11014- DEVARAKONDA GUNA VAISHNAVI*

Question: The sum of the first n terms of two arithmetic progressions (AP) is in the ratio $5n+4 : 9n+6$. Find the ratio of their 18th terms.

Solution: :

Parameter	value	Description
$x_1(0)$	$\frac{9}{2}$	First term of the first arithmetic progression (AP).
$x_2(0)$	$\frac{15}{2}$	First term of the second arithmetic progression (AP).
d_1	5	Common difference of the first AP.
d_2	9	Common difference of the second AP.
n	-	Index of the term in the sequences.

TABLE I
INPUT PARAMETERS

$$x_1(n) = (x_1(0) + nd_1)u(n) \quad (1)$$

$$x_2(n) = (x_2(0) + nd_2)u(n) \quad (2)$$

$$\frac{y_1(n)}{y_2(n)} = \frac{\frac{n}{2} [2x_1(0) + (n-1)d_1]}{\frac{n}{2} [2x_2(0) + (n-1)d_2]} = \frac{5n+4}{9n+6} \quad (3)$$

$$\frac{2x_1(0) + nd_1 - d_1}{2x_2(0) + nd_2 - d_2} = \frac{5n+4}{9n+6} \quad (4)$$

On comparing we get, $d_1 = 5$ and $d_2 = 9$

$$2x_1(0) - d_1 = 4 \quad (5)$$

$$x_1(0) = \frac{9}{2} \quad (6)$$

$$2x_2(0) - d_2 = 6 \quad (7)$$

$$x_2(0) = \frac{15}{2} \quad (8)$$

Refer (??) and (??)from appendix

$$\Rightarrow X_1(z^{-1}) = \frac{9/2}{1-z^{-1}} + \frac{5z^{-1}}{(1-z^{-1})^2} \quad (9)$$

$$\Rightarrow X_2(z^{-1}) = \frac{15/2}{1-z^{-1}} + \frac{9z^{-1}}{(1-z^{-1})^2} \quad (10)$$

$$x_1(n) = \{9/2, 19/2, 29/2, \dots\} \quad (11)$$

$$x_2(n) = \{15/2, 33/2, 51/2, \dots\} \quad (12)$$

$$\Rightarrow \frac{x_1(18)}{x_2(18)} = \frac{179}{321} \quad (13)$$

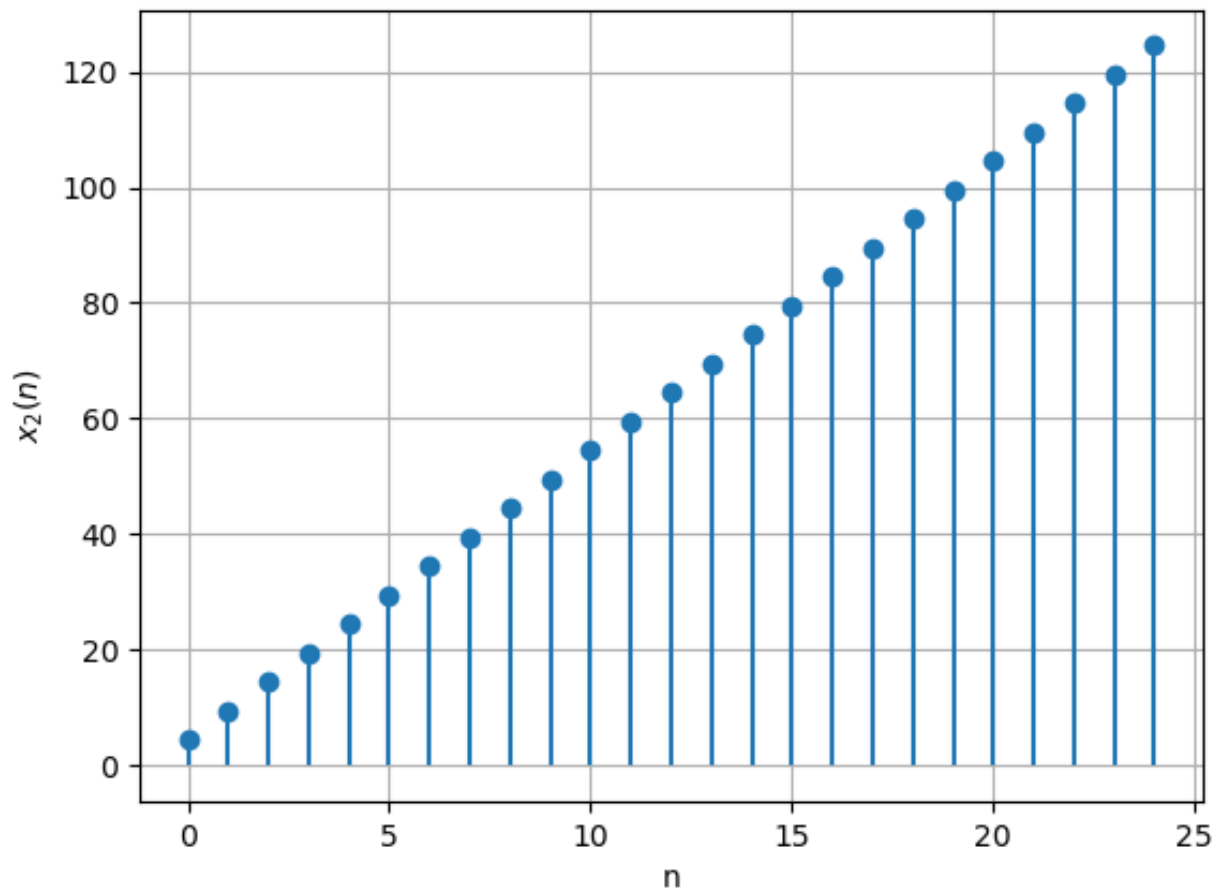


Fig. 1. stem plot of $x_1(n)$

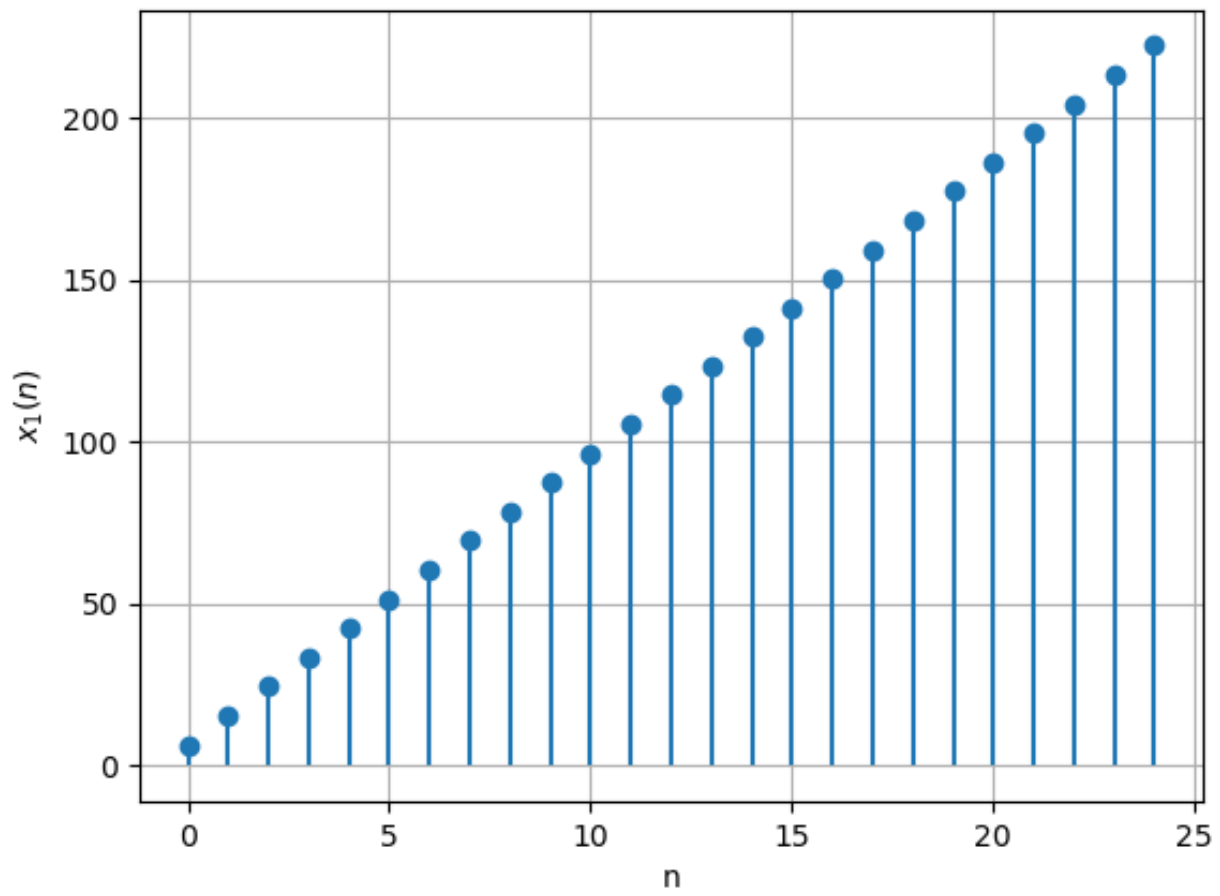


Fig. 2. stem plot of $x_2(n)$