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

$$x_1(n) = (x_1(0) + nd_1)u(n) \tag{1}$$

$$x_2(n) = (x_2(0) + nd_2)u(n) \tag{2}$$

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

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

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

$$2x_1(0) - d_1 = 4 \tag{5}$$

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

$$2x_2(0) - d_2 = 6 \tag{7}$$

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

Refer equation(**??**) and equation(**??**)from appendix

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

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

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

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

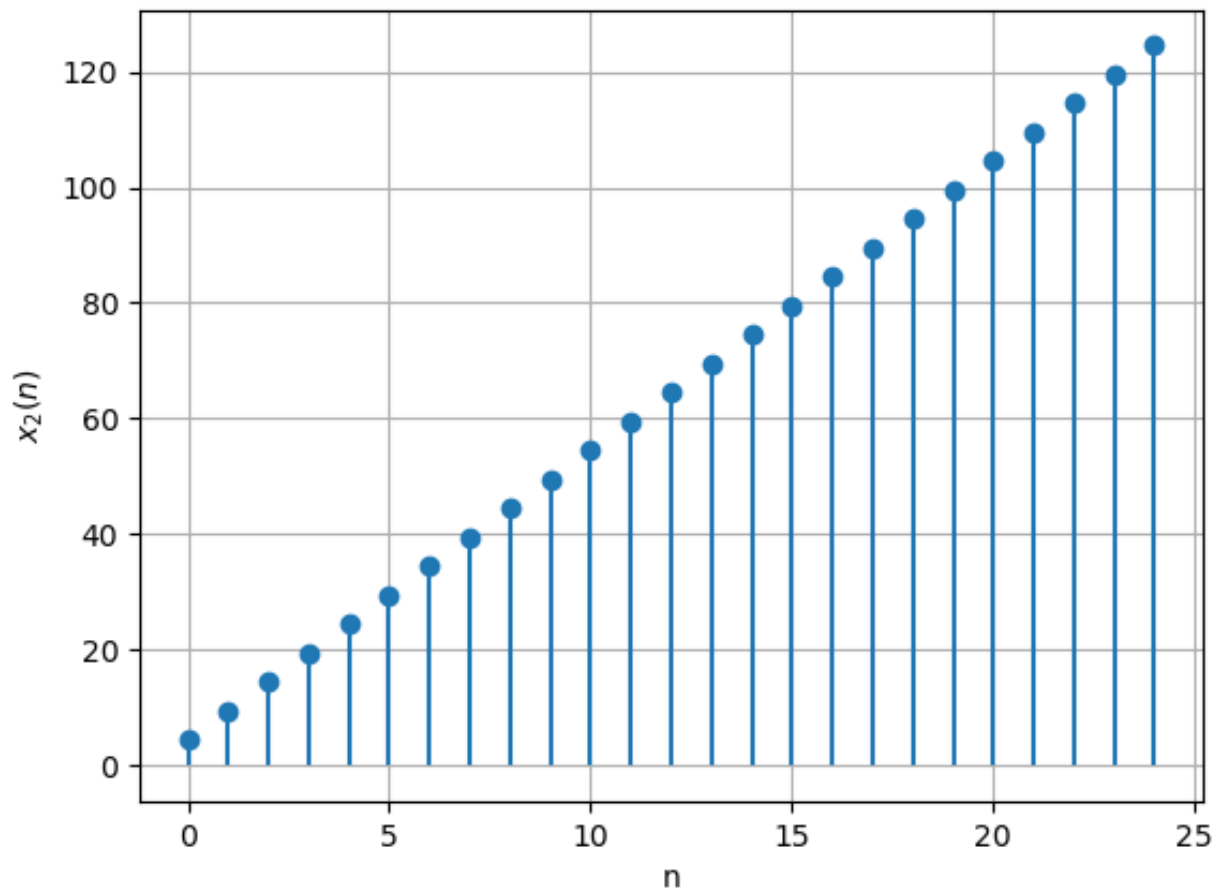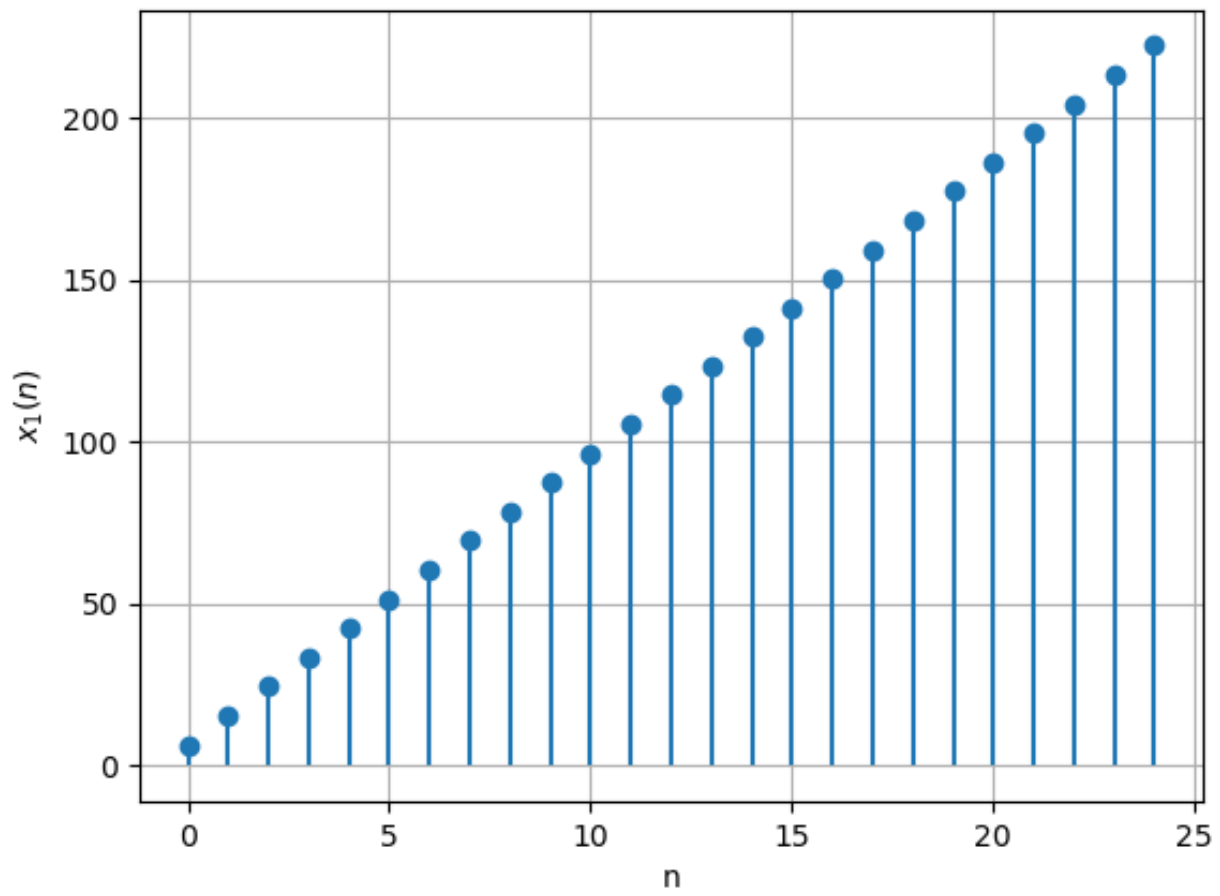$$\implies \frac{x_1(18)}{x_2(18)} = \frac{179}{321} \tag{13}$$

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

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