

10.05.2

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QUESTION:

1. In the following APs, find the missing terms in the boxes:

- (i) 2, \square , 26
 (ii) \square , 13, \square , 3
 (iii) 5, \square , \square , $9\frac{1}{2}$
 (iv) $-4'$, \square , \square , \square , \square , 6
 (v) \square , 38, \square , \square , \square , $-22'$

Solution:

n	$x_1(n)$	$x_2(n)$	$x_3(n)$	$x_4(n)$	$x_5(n)$
0	2	18	5	-4	53
1	14	13	$6\frac{1}{2}$	-2	38
2	26	8	8	0	23
3	38	3	$9\frac{1}{2}$	2	8
4	50	-2	11	4	-7
5	62	-7	$12\frac{1}{2}$	6	-22

TABLE I

FIRST THREE TERMS OF AP SERIES

$$\begin{aligned} \text{(i)} \quad a_1 &= 2, a_3 = 26, a_3 = a + 2d \\ \Rightarrow 26 &= 2 + 2d \Rightarrow 24 = 2d \quad \therefore d = 12 \\ a_2 &= 14 \end{aligned}$$

$$\begin{aligned} \text{(ii)} \quad a_2 &= 13, a_4 = 3, a_2 = a + d, a_4 = a + 3d \\ \Rightarrow 3 - 13 &= 2d \Rightarrow -10 = 2d \quad \therefore d = -5 \\ a_1 &= 18, a_3 = 8 \end{aligned}$$

$$\begin{aligned} \text{(iii)} \quad a_1 &= 5, a_4 = 9\frac{1}{2}, a_4 = a + 3d \\ \Rightarrow 9\frac{1}{2} &= 5 + 3d \Rightarrow 3d = 4\frac{1}{2} \quad \therefore d = 1\frac{1}{2} \\ a_2 &= 6\frac{1}{2}, a_3 = 8 \end{aligned}$$

$$\begin{aligned} \text{(iv)} \quad a_1 &= -4, a_6 = 6, a_6 = a + 5d \\ \Rightarrow 6 - (-4) &= 5d \Rightarrow 10 = 5d \quad \therefore d = 2 \\ a_2 &= -2, a_3 = 0, a_4 = 2, a_5 = 4 \end{aligned}$$

$$\begin{aligned} \text{(v)} \quad a_2 &= 38, a_6 = -22 \\ \Rightarrow -22 - 38 &= 4d \Rightarrow -60 = 4d \quad \therefore d = -15 \\ a_1 &= 53, a_3 = 23, a_4 = 8, a_5 = -7 \end{aligned}$$

1) The Z-transform of $x(n) = 2 + 12n$ is given by:

$$X(z) = \sum_{n=-\infty}^{\infty} x(n)u(n) \times z^{-n} \quad (1)$$

$$X(z) = \sum_{n=-\infty}^{\infty} (2 + 12n)u(n) \times z^{-n} \quad (2)$$

$$X(z) = 2 \times \frac{1}{1 - z^{-1}} + 12 \times \frac{z^{-1}}{(1 - z^{-1})^2} \quad (3)$$

$$X(z) = \frac{2 + 10z^{-1}}{(1 - z^{-1})^2} \quad |z| > 1 \quad (4)$$

$$(5)$$

2) The Z-transform of $x(n) = 18 - 5n$ is given by:

$$X(z) = \sum_{n=-\infty}^{\infty} x(n)u(n) \times z^{-n} \quad (6)$$

$$X(z) = \sum_{n=-\infty}^{\infty} (18 - 5n)u(n) \times z^{-n} \quad (7)$$

$$X(z) = 18 \times \frac{1}{1 - z^{-1}} - 5 \times \frac{z^{-1}}{(1 - z^{-1})^2} \quad (8)$$

$$X(z) = \frac{18 - 23z^{-1}}{(1 - z^{-1})^2} \quad |z| > 1 \quad (9)$$

$$(10)$$

3) Z-transform of $x(n) = 5 + \frac{3}{2}n$ is given by:

$$X(z) = \sum_{n=-\infty}^{\infty} x(n)u(n) \times z^{-n} \quad (11)$$

$$X(z) = \sum_{n=-\infty}^{\infty} (5 + \frac{3}{2}n)u(n) \times z^{-n} \quad (12)$$

$$X(z) = 5 \times \frac{1}{1 - z^{-1}} + \frac{3}{2} \times \frac{z^{-1}}{(1 - z^{-1})^2} \quad (13)$$

$$X(z) = \frac{5 - \frac{3}{2}z^{-1}}{(1 - z^{-1})^2} \quad |z| > 1 \quad (14)$$

$$(15)$$

4) Z-transform of $x(n) = -4 + 2n$ is given by:

$$X(z) = \sum_{n=-\infty}^{\infty} x(n)u(n) \times z^{-n} \quad (16)$$

$$X(z) = \sum_{n=-\infty}^{\infty} (-4 + 2n)u(n) \times z^{-n} \quad (17)$$

$$X(z) = -4 \times \frac{1}{1 - z^{-1}} + 2 \times \frac{z^{-1}}{(1 - z^{-1})^2} \quad (18)$$

$$X(z) = \frac{-4 + 6z^{-1}}{(1 - z^{-1})^2} \quad |z| > 1 \quad (19)$$

$$(20)$$

5) Z-transform of $x(n) = 53 - 15n$ is given by:

$$X(z) = \sum_{n=-\infty}^{\infty} x(n)u(n) \times z^{-n} \quad (21)$$

$$X(z) = \sum_{n=-\infty}^{\infty} (53 - 15n)u(n) \times z^{-n} \quad (22)$$

$$X(z) = 53 \times \frac{1}{1 - z^{-1}} - 15 \times \frac{z^{-1}}{(1 - z^{-1})^2} \quad (23)$$

$$X(z) = \frac{53 - 68z^{-1}}{(1 - z^{-1})^2} \quad |z| > 1 \quad (24)$$

$$(25)$$

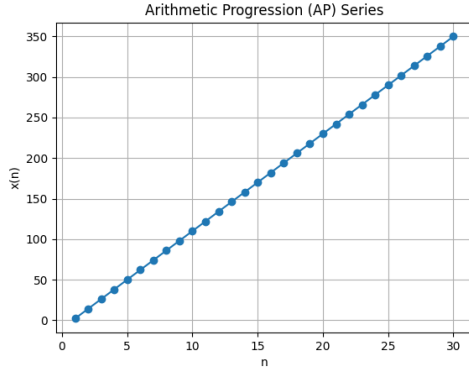


Fig. 1.

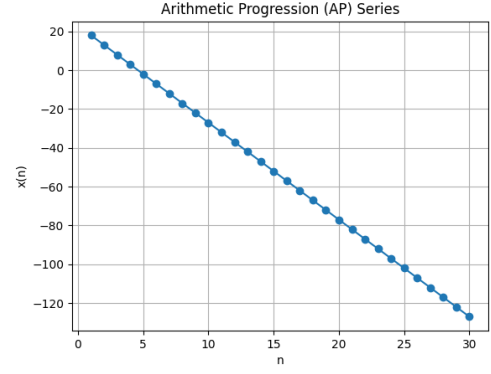


Fig. 2.

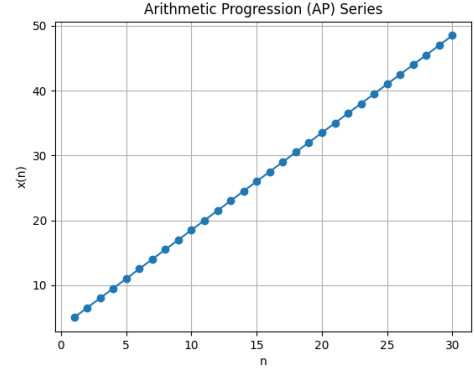


Fig. 3.

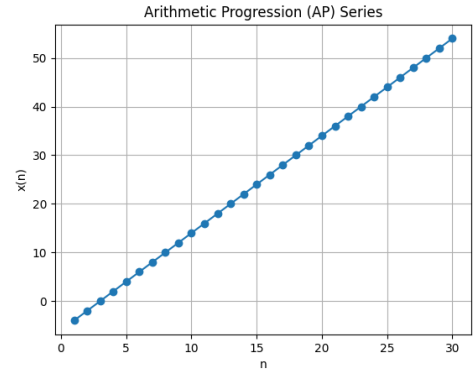


Fig. 4.

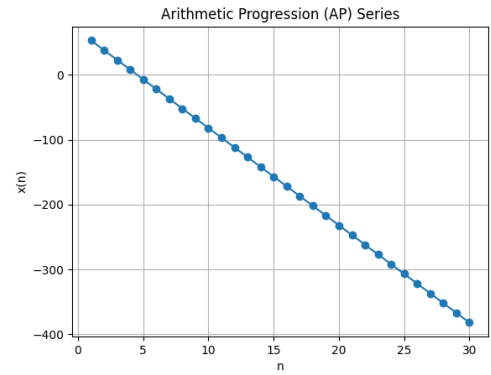


Fig. 5.