

10.05.2

EE23BTECH11053-R.Rahul*

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:

a_0	d	a_1	a_2	a_3
2	12	14	26	38
18	-5	13	8	3
5	$1\frac{1}{2}$	$6\frac{1}{2}$	8	$9\frac{1}{2}$
-4	2	-2	0	2
53	-15	38	23	8

TABLE I

FIRST THREE TERMS OF AP SERIES

- (i) $a_1=2$ $a_3=26$ $a_3=a+2d$
 $\Rightarrow 26=2+2*d \Rightarrow d=12$
 $a_2=14$
(ii) $a_2=13$ $a_4=3$, $a_2=a+d$ $a_4=a+3d$
 $\Rightarrow 3-13=2d \Rightarrow d=-5$
 $a_1=18$, $a_3=8$
(iii) $a_1=5$, $a_4=9\frac{1}{2}$ $a_4=a+3d$
 $\Rightarrow 9\frac{1}{2}=5+3d \Rightarrow 3d=4\frac{1}{2} \Rightarrow d=1\frac{1}{2}$
 $a_2=6\frac{1}{2}$, $a_3=8$
(iv) $a_1=-4$ $a_6=6$ $a_6=a+5d$
 $\Rightarrow 6=-4+5d \Rightarrow 10=5d \Rightarrow d=2$
 $a_2=-2$ $a_3=0$ $a_4=2$ $a_5=4$
(v) $a_2=38$ $a_6=-22$
 $\Rightarrow -22-38=4d \Rightarrow d=-15$
 $a_1=53$ $a_3=23$ $a_4=8$ $a_5=-7$

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

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

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

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

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

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

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

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

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

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

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

$$X(z) = \frac{13 - 18z^{-1}}{(1 - z^{-1})^2} \quad |z| > 1$$

(iii) Z-transform of $x[n] = 5 + 1\frac{1}{2}n$ is given by:

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

$$X(z) = \sum_{n=-\infty}^{\infty} (5 + 1\frac{1}{2}n) \cdot u(n) \times z^{-n}$$

$$X(z) = 5 \sum_{n=-\infty}^{\infty} u(n) \times z^n + 1\frac{1}{2} \sum_{n=-\infty}^{\infty} nu(n) \times z^{-n}$$

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

$$X(z) = \frac{6\frac{1}{2} - 5z^{-1}}{(1 - z^{-1})^2} \quad |z| > 1$$

(iv) Z-transform of $x[n] = 2 + 12n$ is given by:

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

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

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

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

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

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

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

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

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

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

$$X(z) = \frac{38 - 53z^{-1}}{(1 - z^{-1})^2} \quad |z| > 1$$

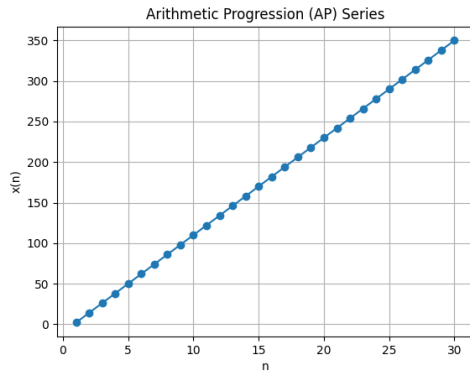


Fig. 1.

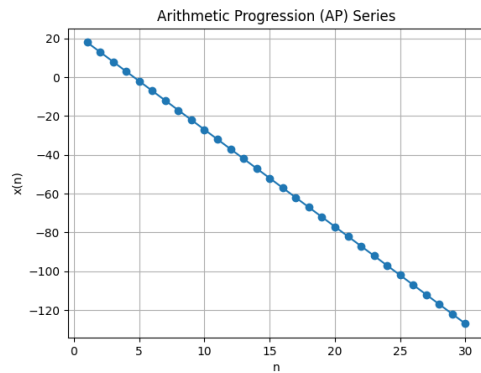


Fig. 2.

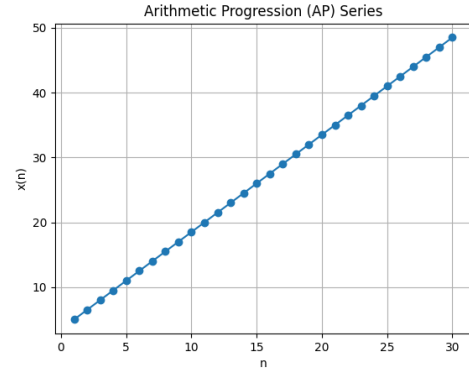


Fig. 3.

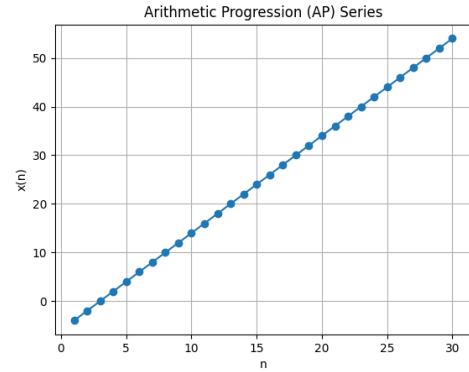


Fig. 4.

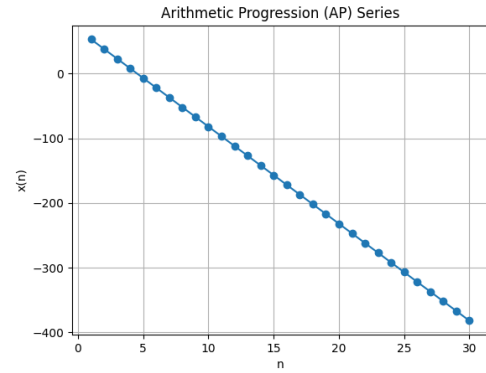


Fig. 5.