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:

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

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

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

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

$\therefore$

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

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

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

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

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

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

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

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

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

$\therefore$

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

$\therefore$

$$X(z) = \frac{6 - 18z^{-}1}{(1 - z^{-}1)^2}$$

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

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

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

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

$\therefore$

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

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

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

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

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

$$\therefore$$

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

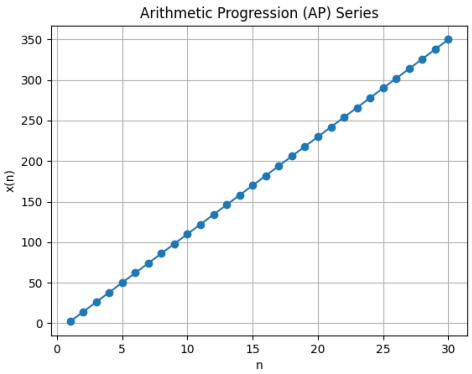

Fig. 1.

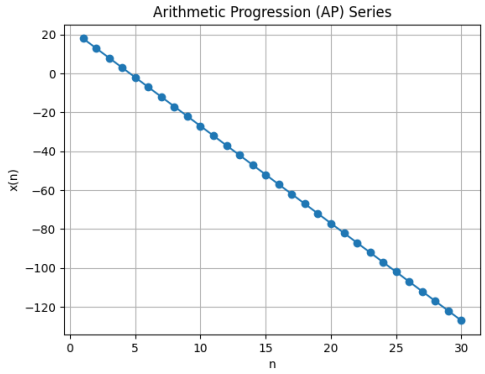

Fig. 2.

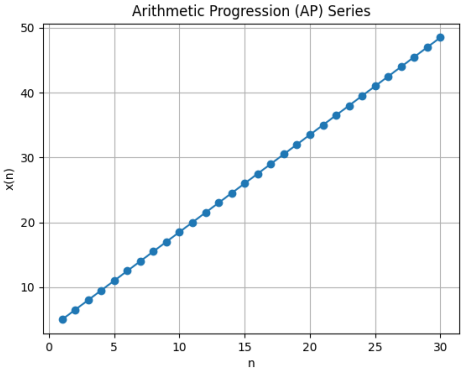

Fig. 3.

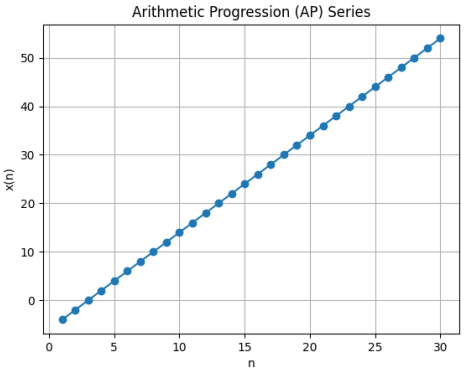

Fig. 4.

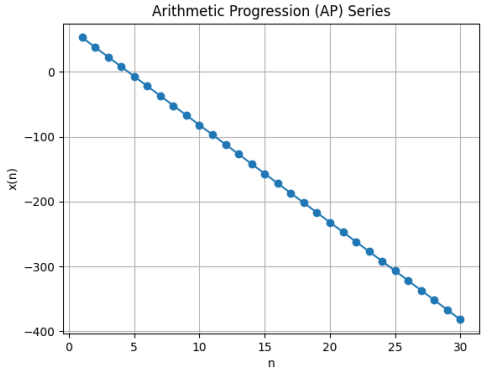

Fig. 5.