

EXERCISE 9.1

Question 1:

Write the first five terms of the sequences whose n^{th} term is $a_n = n(n+2)$

Ans

$$a_n = n(n+2)$$

Substituting n = 1, 2, 3, 4, and 5, we obtain

$$a_1 = 1(1+2) = 3$$

$$a_2 = 2(2+2) = 8$$

$$a_3 = 3(3+2) = 15$$

$$a_4 = 4(4+2) = 24$$

$$a_5 = 5(5+2) = 35$$

Therefore, the required terms are 3, 8, 15, 24, and 35.

Question 2:

Write the first five terms of the sequences whose n^{th} term is $a_n = \frac{n}{n+1}$

Ans:

$$a_n = \frac{n}{n+1}$$

Substituting n = 1, 2, 3, 4, 5, we obtain

$$a_1 = \frac{1}{1+1} = \frac{1}{2}, \ a_2 = \frac{2}{2+1} = \frac{2}{3}, \ a_3 = \frac{3}{3+1} = \frac{3}{4}, \ a_4 = \frac{4}{4+1} = \frac{4}{5}, \ a_5 = \frac{5}{5+1} = \frac{5}{6}$$

Therefore, the required terms are $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$, $\frac{4}{5}$, and $\frac{5}{6}$.

Question 3:

Write the first five terms of the sequences whose n^{th} term is $a_n = 2^n$ Ans:

$$a_n = 2^n$$

Substituting n = 1, 2, 3, 4, 5, we obtain

$$a_1 = 2^1 = 2$$

$$a_2 = 2^2 = 4$$

$$a_3 = 2^3 = 8$$

$$a_4 = 2^4 = 16$$

$$a_5 = 2^5 = 32$$

Therefore, the required terms are 2, 4, 8, 16, and 32. Question 4:

Write the first five terms of the sequences whose n^{th} term is $a_n = \frac{2n-3}{6}$

Ans

Substituting n = 1, 2, 3, 4, 5, we obtain

$$a_i = \frac{2 \times 1 - 3}{6} = \frac{-1}{6}$$

$$a_2 = \frac{2 \times 2 - 3}{6} = \frac{1}{6}$$

$$a_3 = \frac{2 \times 3 - 3}{6} = \frac{3}{6} = \frac{1}{2}$$

$$a_4 = \frac{2 \times 4 - 3}{6} = \frac{5}{6}$$

$$a_5 = \frac{2 \times 5 - 3}{6} = \frac{7}{6}$$

Therefore, the required terms are $\frac{-1}{6}$, $\frac{1}{6}$, $\frac{1}{2}$, $\frac{5}{6}$, and $\frac{7}{6}$.

Question 5:

Write the first five terms of the sequences whose n^{th} term is $a_n = (-1)^{n-1} 5^{n+1}$

Ans:

Substituting n = 1, 2, 3, 4, 5, we obtain

$$a_1 = (-1)^{t-1} 5^{t+1} = 5^2 = 25$$

$$a_2 = (-1)^{2-1} 5^{2+1} = -5^3 = -125$$

$$a_3 = (-1)^{3-1} 5^{3+1} = 5^4 = 625$$

$$a_4 = (-1)^{4-1} 5^{4+1} = -5^5 = -3125$$

$$a^5 = (-1)^{5-1} 5^{5+1} = 5^6 = 15625$$

Therefore, the required terms are 25, -125, 625, -3125, and 15625.

Question 6:

Write the first five terms of the sequences whose n^{th} term is $a_n = n \frac{n^2 + 5}{4}$

Ans:

Substituting n = 1, 2, 3, 4, 5, we obtain

$$a_{1} = 1 \cdot \frac{1^{2} + 5}{4} = \frac{6}{4} = \frac{3}{2}$$

$$a_{2} = 2 \cdot \frac{2^{2} + 5}{4} = 2 \cdot \frac{9}{4} = \frac{9}{2}$$

$$a_{3} = 3 \cdot \frac{3^{2} + 5}{4} = 3 \cdot \frac{14}{4} = \frac{21}{2}$$

$$a_{4} = 4 \cdot \frac{4^{2} + 5}{4} = 21$$

$$a_{5} = 5 \cdot \frac{5^{2} + 5}{4} = 5 \cdot \frac{30}{4} = \frac{75}{2}$$

Therefore, the required terms are $\frac{3}{2}$, $\frac{9}{2}$, $\frac{21}{2}$, 21, and $\frac{75}{2}$.

Question 7:

Find the 17th term in the following sequence whose n^{th} term is $a_n = 4n - 3$; a_{17} , a_{24}

Ans:

Substituting n = 17, we obtain

$$a_{17} = 4(17) - 3 = 68 - 3 = 65$$

Substituting n = 24, we obtain

$$a_{24} = 4(24) - 3 = 96 - 3 = 93$$

Question 8:

Find the 7th term in the following sequence whose n^{th} term is $a_n = \frac{n^2}{2n}$; a_7

Ans:

Substituting n = 7, we obtain

$$a_7 = \frac{7^2}{2^7} = \frac{49}{128}$$

Question 9:

Find the 9th term in the following sequence whose n^{th} term is $a_n = (-1)^{n-1} n^3$; a_9 Ans:

Substituting n = 9, we obtain

$$a_9 = (-1)^{9-1} (9)^3 = (9)^3 = 729$$

Question 10:

Find the 20th term in the following sequence whose n^{th} term is $a_n = \frac{n(n-2)}{n+3}$; a_{20}

Ans:

Substituting n = 20, we obtain

$$a_{20} = \frac{20(20-2)}{20+3} = \frac{20(18)}{23} = \frac{360}{23}$$

Question 11:

Write the first five terms of the following sequence and obtain the corresponding series:

$$a_1 = 3$$
, $a_n = 3a_{n-1} + 2$ for all $n > 1$

Ans

$$a_1 = 3, a_n = 3a_{n-1} + 2$$
 for all $n > 1$

$$\Rightarrow a_2 = 3a_1 + 2 = 3(3) + 2 = 11$$

$$a_3 = 3a_7 + 2 = 3(11) + 2 = 35$$

$$a_4 = 3a_3 + 2 = 3(35) + 2 = 107$$

$$a_5 = 3a_4 + 2 = 3(107) + 2 = 323$$

Hence, the first five terms of the sequence are 3, 11, 35, 107, and 323.

The corresponding series is 3 + 11 + 35 + 107 + 323 + ...

Question 12:

Write the first five terms of the following sequence and obtain the corresponding series:

$$a_1 = -1, a_n = \frac{a_{n-1}}{n}, n \ge 2$$

Ans

$$a_1 = -1, a_n = \frac{a_{n-1}}{n}, n \ge 2$$

$$\Rightarrow a_2 = \frac{a_1}{2} = \frac{-1}{2}$$

$$a_3 = \frac{a_2}{3} = \frac{-1}{6}$$

$$a_4 = \frac{a_3}{4} = \frac{-1}{24}$$

$$a_5 = \frac{a_4}{4} = \frac{-1}{120}$$

Hence, the first five terms of the sequence are -1, $\frac{-1}{2}$, $\frac{-1}{6}$, $\frac{-1}{24}$, and $\frac{-1}{120}$

The corresponding series is
$$\left(-1\right)+\left(\frac{-1}{2}\right)+\left(\frac{-1}{6}\right)+\left(\frac{-1}{24}\right)+\left(\frac{-1}{120}\right)+\dots$$

Question 13:

Write the first five terms of the following sequence and obtain the corresponding series:

$$a_1 = a_2 = 2, a_n = a_{n-1} - 1, n > 2$$

Ans:

$$a_1 = a_2 = 2, a_n = a_{n-1} - 1, n > 2$$

$$\Rightarrow a_3 = a_2 - 1 = 2 - 1 = 1$$

$$a_4 = a_3 - 1 = 1 - 1 = 0$$

$$a_5 = a_4 - 1 = 0 - 1 = -1$$

Hence, the first five terms of the sequence are 2, 2, 1, 0, and -1.

The corresponding series is 2 + 2 + 1 + 0 + (-1) + ...

Question 14:

The Fibonacci sequence is defined by

$$1 = a_1 = a_2$$
 and $a_n = a_{n-1} + a_{n-2}$, $n > 2$

Find
$$\frac{a_{n+1}}{a_n}$$
, for $n = 1, 2, 3, 4, 5$

Ans:

$$1 = a_1 = a_2$$

$$a_n = a_{n-1} + a_{n-2}, n > 2$$

$$a_3 = a_2 + a_1 = 1 + 1 = 2$$

$$a_4 = a_3 + a_2 = 2 + 1 = 3$$

$$a_5 = a_4 + a_3 = 3 + 2 = 5$$

$$a_6 = a_5 + a_4 = 5 + 3 = 8$$

$$\therefore \text{ For } n = 1, \ \frac{a_n + 1}{a_n} = \frac{a_2}{a_1} = \frac{1}{1} = 1$$

$$\text{For } n = 2, \ \frac{a_n + 1}{a_n} = \frac{a_3}{a_2} = \frac{2}{1} = 2$$

$$\text{For } n = 3, \frac{a_n + 1}{a_n} = \frac{a_4}{a_3} = \frac{3}{2}$$

For
$$n = 4$$
, $\frac{a_n + 1}{a_n} = \frac{a_5}{a_4} = \frac{5}{3}$

For
$$n = 5$$
, $\frac{a_n + 1}{a_n} = \frac{a_6}{a_5} = \frac{8}{5}$

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