CLASS XI CHAPTER : SEQUENCES & SERIES

EXERCISE 9.1 (NCERT)

* Write the first five terms of each of sequences in Exercise 1 to 6 whose n^{th} terms are:

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

Soln: Put $n = 1, 2, 3, 4, 5$ in $a_n = n(n+2)$ so that

$a_1 = 1(1+2) = 1(3) = 3$ $\quad$ $a_4 = 4(4+2) = 4(6) = 24$

$a_2 = 2(2+2) = 2(4) = 8$ $\quad$ $a_5 = 5(5+2) = 5(7) = 35$

$a_3 = 3(3+2) = 3(5) = 15$

$\therefore$ First 5 terms of sequence are 3, 8, 15, 24, 35.

Q No 2 $a_n = \dfrac{n}{n+1}$

Sol. Put $n = 1, 2, 3, 4, 5$ in $a_n = \dfrac{n}{n+1}$ so that

$a_1 = \dfrac{1}{1+1} = \dfrac{1}{2}$ $\quad$ $a_4 = \dfrac{4}{4+1} = \dfrac{4}{5}$

$a_2 = \dfrac{2}{2+1} = \dfrac{2}{3}$ $\quad$ $a_5 = \dfrac{5}{5+1} = \dfrac{5}{6}$

$a_3 = \dfrac{3}{3+1} = \dfrac{3}{4}$

Q No 3. $a_n = 2^n$

Sol: Put $n = 1, 2, 3, 4, 5$ in $a_n = 2^n$ so that

$a_1 = 2^1 = 2$ $\quad$ $a_4 = 2^4 = 2\times2\times2\times2 = 16$

$a_2 = 2^2 = 2\times2 = 4$ $\quad$ $a_5 = 2^5 = 2\times2\times2\times2\times2 = 32$

$a_3 = 2^3 = 2\times2\times2 = 8$

Q No 4 $a_n = (-1)^{n-1}\, 5^{n+1}$

Sol: Put $n = 1, 2, 3, 4, 5$ in $a_n = (-1)^{n-1}\, 5^{n+1}$ so that

$a_1 = (-1)^{1-1}\, 5^{1+1} = (-1)^0\, 5^2 = 1\times5\times5 = 25$

$a_2 = (-1)^{2-1}\, 5^{2+1} = (-1)^1\, 5^3 = -5\times5\times5 = -125$

$a_3 = (-1)^{3-1}\, 5^{3+1} = (-1)^2\, 5^4 = 5\times5\times5\times5 = 625$

$a_4 = (-1)^{4-1}\, 5^{4+1} = (-1)^3\, 5^5 = -5\times5\times5\times5\times5 = -3125$

$a_5 = (-1)^{5-1}\, 5^{5+1} = (-1)^4\, 5^6 = 5\times5\times5\times5\times5\times5 = 15625$

Q No 6 $a_n = n\dfrac{n^2+5}{4}$

Sol.. Put $n = 1, 2, 3, 4, 5$ in $a_n = n\dfrac{n^2+5}{4}$ so that

$$a_1 = 1.\frac{(1)^2+5}{4} = 1.\frac{1+5}{4} = \frac{6}{4} = \frac{3}{2}$$

$$a_2 = 2\frac{(2)^2+5}{4} = 2.\frac{4+5}{4} = 2.\frac{9}{4} = \frac{9}{2}$$

$$a_3 = 3.\frac{(3)^2+5}{4} = 3\times\frac{9+5}{4} = 3\times\frac{14}{4} = \frac{21}{2}$$

$$a_4 = 4.\frac{(4)^2+5}{4} = 4\times\frac{16+5}{4} = 4\times\frac{21}{4} = 21$$

$$a_5 = 5.\frac{(5)^2+5}{4} = 5\times\frac{25+5}{4} = 5\times\frac{30}{4} = \frac{75}{2}$$

* find the indicated terms in the sequences in Exercises 7 to 10 whose nth terms are:

Q No 7 $a_n = 4n-3$; a_{17}, a_{24}

Sol. For a_{17} put $n = 17$ in $a_n = 4n-3$.

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

for a_{24} put $n = 24$ in $a_n = 4n-3$

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

Q No. 8 $a_n = \dfrac{n^2}{2^n}$; a_7

Sol. for a_7 put $n = 7$ in $a_n = \dfrac{n^2}{2^n}$

$$\therefore a_7 = \frac{(7)^2}{2^7} = \frac{7\times7}{2\times2\times2\times2\times2\times2\times2} = \frac{49}{128}$$

Q No. 9 $a_n = (-1)^{n-1} n^3$; a_9

Sol.. For a_9 put $n = 9$ in $a_n = (-1)^{9-1}(9)^3$.

$$a_9 = (-1)^{9-1}(9)^3 = (-1)^8 . 9^3 = +9\times9\times9 = 729$$

Q No 10 $a_n = \frac{n(n-2)}{n+3}$; a_{20}

Sol. For a_{20} put $n = 20$ in $a_n = \frac{n(n-2)}{n+3}$.

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

* Write first 5 terms in each of the sequences in Exercise 11 to 13 and obtain the corresponding series.

Q No 11 $a_1 = 3$, $a_n = 3a_{n-1} + 2$ for all $n > 1$

Sol

$a_1 = 3$

$a_2 = 3a_{2-1} + 2 = 3a_1 + 2 = 3(3) + 2 = 11$

$a_3 = 3a_{3-1} + 2 = 3a_2 + 2 = 3(11) + 2 = 35$

$a_4 = 3a_{4-1} + 2 = 3a_3 + 2 = 3(35) + 2 = 107$

$a_5 = 3a_{5-1} + 2 = 3a_4 + 2 = 3(107) + 2 = 323$

$\therefore$ First 5 terms of seq. are 3, 11, 35, 107, 323

and The required Series is $3 + 11 + 35 + 107 + 323 + \cdots\cdots$

Q No 12 $a_1 = -1$, $a_n = \frac{a_{n-1}}{n}$, $n \geq 2$.

Sol.

$a_1 = -1$

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

$a_3 = \frac{a_{3-1}}{3} = \frac{a_2}{3} = \frac{-\frac{1}{2}}{3} = -\frac{1}{6}$

$a_4 = \frac{a_{4-1}}{3+1} = \frac{a_3}{3+1} = \frac{-\frac{1}{6}}{3+1} = -\frac{1}{24}$

$a_4 = \frac{a_{4-1}}{4} = \frac{a_3}{4} = \frac{-\frac{1}{6}}{4} = -\frac{1}{24}$

$a_5 = \frac{a_{5-1}}{5} = \frac{a_4}{5} = \frac{-\frac{1}{24}}{5} = -\frac{1}{120}$

$\therefore$ First 5 terms of Sequence are (-1), $\left(-\frac{1}{2}\right), \left(-\frac{1}{6}\right), \left(-\frac{1}{24}\right), \left(-\frac{1}{120}\right)$

and Series is $(-1) + \left(-\frac{1}{2}\right) + \left(-\frac{1}{6}\right) + \left(-\frac{1}{24}\right) + \left(-\frac{1}{120}\right) + \cdots\cdots$

Q No 13: $a_1 = a_2 = 2$, $a_n = a_{n-1} - 1$; $n > 2$

Sol:

$a_1 = 2$

$a_2 = 2$

$a_3 = a_{3-1} - 1 = a_2 - 1 = 2 - 1 = 1$

$a_4 = a_{4-1} - 1 = a_3 - 1 = 1 - 1 = 0$

$a_5 = a_{5-1} - 1 = a_4 - 1 = 0 - 1 = -1$

$\therefore$ The first 5 terms of the sequence are.

$2, 2, 1, 0, -1$

and the series is $(2) + 2 + 1 + 0 + (-1) + \cdots\cdots$

Q No 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 $n = 1, 2, 3, 4, 5$.

Sol

$a_1 = 1$

$a_2 = 1$.

$a_3 = a_{3-1} + a_{3-2} = a_2 + a_1 = 1 + 1 = 2$.

$a_4 = a_{4-1} + a_{4-2} = a_3 + a_2 = 2 + 1 = 3$.

$a_5 = a_{5-1} + a_{5-2} = a_4 + a_3 = 3 + 2 = 5$

$a_6 = a_{6-1} + a_{6-2} = a_5 + a_4 = 5 + 3 = 8$

Now for $n = 1$ $\quad \frac{a_{n+1}}{a_n} = \frac{a_2}{a_1} = \frac{1}{1} = 1$

$n = 2$ $\quad \frac{a_{n+1}}{a_n} = \frac{a_3}{a_2} = \frac{2}{1} = 2$.

$n = 3$ $\quad \frac{a_{n+1}}{a_n} = \frac{a_4}{a_3} = \frac{3}{2}$

$n = 4$ $\quad \frac{a_{n+1}}{a_n} = \frac{a_5}{a_4} = \frac{5}{3}$

$n = 5$ $\quad \frac{a_{n+1}}{a_n} = \frac{a_6}{a_5} = \frac{8}{5}$