

Chapter 9: Sequences and Series Exercise 9.1

NCERT · Class 11 · Maths

Questions

Question 1

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

Solution

Given,

n^{th} term of a sequence $a_n = n(n + 2)$

On substituting $n = 1, 2, 3, 4,$ and 5 , we get the first five terms

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

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

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

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

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

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

Question 2

$$a_n = n/n+1$$

Solution

Given n^{th} term, $a_n = n/n+1$

On substituting $n = 1, 2, 3, 4, 5$, we get

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

Hence, the required terms are $1/2$, $2/3$, $3/4$, $4/5$ and $5/6$.

Question 3

$$a_n = 2^n$$

Solution

Given n^{th} term, $a_n = 2^n$

On substituting $n = 1, 2, 3, 4, 5$, we get

$$a_1 = 2^1 = 2$$

$$a_2 = 2^2 = 4$$

$$a_3 = 2^3 = 8$$

$$a_4 = 2^4 = 16$$

$$a_5 = 2^5 = 32$$

Hence, the required terms are 2, 4, 8, 16, and 32.

Question 4

$$a_n = (2n - 3)/6$$

Solution

Given n^{th} term, $a_n = (2n - 3)/6$

On substituting $n = 1, 2, 3, 4, 5$, we get

$$a_1 = \frac{2 \times 1 - 3}{6} = \frac{-1}{6}$$

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

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

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

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

Hence, the required terms are $-1/6$, $1/6$, $1/2$, $5/6$ and $7/6$.

Question 5

$$a_n = (-1)^{n-1} 5^{n+1}$$

Solution

Given n^{th} term, $a_n = (-1)^{n-1} 5^{n+1}$

On substituting $n = 1, 2, 3, 4, 5$, we get

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

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

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

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

$$a_5 = (-1)^{5-1} 5^{5+1} = 5^6 = 15625$$

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

Question 6

$$a_n = n \frac{n^2 + 5}{4}$$

Solution

On substituting $n = 1, 2, 3, 4, 5$, we get first 5 terms

$$a_1 = 1 \cdot \frac{1^2 + 5}{4} = \frac{6}{4} = \frac{3}{2}$$

$$a_2 = 2 \cdot \frac{2^2 + 5}{4} = 2 \cdot \frac{9}{4} = \frac{9}{2}$$

$$a_3 = 3 \cdot \frac{3^2 + 5}{4} = 3 \cdot \frac{14}{4} = \frac{21}{2}$$

$$a_4 = 4 \cdot \frac{4^2 + 5}{4} = 21$$

$$a_5 = 5 \cdot \frac{5^2 + 5}{4} = 5 \cdot \frac{30}{4} = \frac{75}{2}$$

Hence, the required terms are $3/2$, $9/2$, $21/2$, 21 and $75/2$.

Find the indicated terms in each of the sequences in Exercises 7 to 10 whose n^{th} terms are:

Question 7

$$a_n = 4n - 3; a_{17}, a_{24}$$

Solution

Given,

n^{th} term of the sequence is $a_n = 4n - 3$

On substituting $n = 17$, we get

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

Next, on substituting $n = 24$, we get

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

Question 8

$$a_n = n^2/2^n; a^7$$

Solution

Given,

n^{th} term of the sequence is $a_n = n^2/2^n$

Now, on substituting $n = 7$, we get

$$a_7 = 7^2/2^7 = 49/128$$

Question 9

$$a_n = (-1)^{n-1} n^3; a_9$$

Solution

Given,

$$n^{\text{th}} \text{ term of the sequence is } a_n = (-1)^{n-1} n^3$$

On substituting $n = 9$, we get

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

$$a_n = \frac{n(n-2)}{n+3}; a_{20}$$

Question 10

Solution

On substituting $n = 20$, we get

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

Write the first five terms of each of the sequences in Exercises 11 to 13 and obtain the corresponding series:

Question 11

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

Solution

$$\text{Given, } a_n = 3a_{n-1} + 2 \text{ and } a_1 = 3$$

Then,

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

$$a_3 = 3a_2 + 2 = 3(11) + 2 = 35$$

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

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

Thus, the first 5 terms of the sequence are 3, 11, 35, 107 and 323.

Hence, the corresponding series is

$$3 + 11 + 35 + 107 + 323 + \dots$$

Question 12

$$a_1 = -1, a_n = a_{n-1}/n, n \geq 2$$

Solution

Given,

$$a_n = a_{n-1}/n \text{ and } a_1 = -1$$

Then,

$$a_2 = a_1/2 = -1/2$$

$$a_3 = a_2/3 = -1/6$$

$$a_4 = a_3/4 = -1/24$$

$$a_5 = a_4/5 = -1/120$$

Thus, the first 5 terms of the sequence are -1, -1/2, -1/6, -1/24 and -1/120.

Hence, the corresponding series is

$$-1 + (-1/2) + (-1/6) + (-1/24) + (-1/120) + \dots$$

Question 13

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

Solution

Given,

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

Then,

$$a_3 = a_2 - 1 = 2 - 1 = 1$$

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

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

Thus, the first 5 terms of the sequence are 2, 2, 1, 0 and -1.

The corresponding series is

$$2 + 2 + 1 + 0 + (-1) + \dots$$

Question 14

The Fibonacci sequence is defined by

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

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

Solution

Given,

$$1 = a_1 = a_2$$

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

So,

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

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

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

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

Thus,

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

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

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

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

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