

Mathematics

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(Chapter – 9) (Sequences and Series)

(Class – XI)

Exercise 9.1

Question 1:

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

Answer 1:

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

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

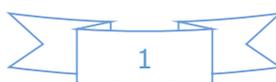
Answer 2:

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

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 $\frac{5}{6}$



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Question 3:

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

Answer 3:

$$a_n = 2^n$$

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 $a_n = \frac{2n-3}{6}$

Answer 4:

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

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

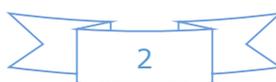
$$a_2 = \frac{2 \times 2 - 3}{6} = \frac{1}{6}$$

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

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

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

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



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Question 5:

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

Answer 5:

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

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

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

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

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

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

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

Answer 6:

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

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

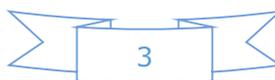
$$a_2 = 2 \cdot \frac{2^2 + 5}{4} = 2 \cdot \frac{9}{4} = \frac{9}{2}$$

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

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

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

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



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Question 7:

Find the 17th term in the following sequence whose n^{th} term is

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

Answer 7:

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 $a_n = \frac{n^2}{2n}; a_7$

Answer 8:

Substituting $n = 7$, we obtain

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

Question 9:

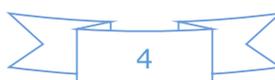
Find the 9th term in the following sequence whose n^{th} term is

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

Answer 9:

Substituting $n = 9$, we obtain

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



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Question 10:

Find the 20th term in the following sequence whose n^{th} term is

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

Answer 10:

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:

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

Answer 11:

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

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

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

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

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

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

The corresponding series is $3 + 11 + 35 + 107 + 323 + \dots$



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Question 12:

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

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

Answer 12:

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

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

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

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

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

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

Question 13:

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

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

Answer 13:

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

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

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

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

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

The corresponding series is $2 + 2 + 1 + 0 + (-1) + \dots$

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 $n = 1, 2, 3, 4, 5$

Answer 14:

$$1 = a_1 = a_2$$

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

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

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

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

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

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

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

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

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

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

