# Class 11th

# Maths

# Chapter 8

# SEQUENCES AND SERIES

# Exersice8.1

**Write the first five terms of each of the sequences in Exercises 1 to 6 whose nth terms are:**

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

**Solution:**

$a_n = n(n + 2)$

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

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

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

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

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

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

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

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

**Solution:**

nth term is given as $a_n = n/(n + 1)$

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

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

$a_2 = 2/(2 + 1) = 2/3$

$a_3 = 3/(3 + 1) = 3/4$

$a_4 = 4/(4 + 1) = 4/5$

$a_5 = 5/(5 + 1) = 5/6$

Therefore, the required terms are 1/2, 2/3, 3/4, 4/5, and 5/6

## 3. $a_n = 2^n$

**Solution:**

Given that $n^{th}$ term is $a_n = 2^n$

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

$a = 2^1 = 2$

$a = 2^2 = 4$

$a = 2^3 = 8$

$a = 2^4 = 16$

$a = 2^5 = 32$

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

## 4. $a_n = (2n - 3)/6$.

**Solution:**

nth term is given as $a_n = (2n - 3)/6$

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

$a_1 = (2(1) - 3)/6 = - 1/6$

$a_2 = (2(2) - 3)/6 = 1/6$

$a_3 = (2(3) - 3)/6 = 1/2$

$a_4 = (2(4) - 3)/6 = 5/6$

$a_5 = (2(5) - 3)/6 = 7/6$

Therefore, the required terms are - 1/6, 1/6, 1/2, 5/6, 7/6

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

**Solution**:

nth term is given as $a_n = (-1)^{n-1} 5^{n+1}$

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

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

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

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

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

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

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

**6.** $a_n = n(n^2 + 5)/4$

**Solution:**

nth term is given as: $a_n = n(n^2 + 5)/4$

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

$a_1 = 1(1^2 + 5)/4 = 3/2$

$a_2 = 2(2^2 + 5)/4 = 9/2$

$a_3 = 3(3^2 + 5)/4 = 21/2$

$a_4 = 4(4^2 + 5)/4 = 21$

$a_5 = 5(5^2 + 5)/4 = 75/2$

Therefore, the required terms are 3/2, 9/2, 21/2, 21, 75/2

**What is the sum of the first 10 terms of the sequence defined by**

**7.** $a_n = 4n - 3$, $a_{17}$, $a_{24}$

**Solution:**

Given, $a_n = 4n - 3$

We have to find the sum of the first 10 terms of the sequence.

$a_1 = 4(1) - 3 = 4 - 3 = 1$

$a_2 = 4(2) - 3 = 8 - 3 = 5$

$a_3 = 4(3) - 3 = 12 - 3 = 9$

$a_4 = 4(4) - 3 = 16 - 3 = 13$

$a_5 = 4(5) - 3 = 20 - 3 = 17$

$a_6 = 4(6) - 3 = 24 - 3 = 21$

$a_7 = 4(7) - 3 = 28 - 3 = 25$

$a_8 = 4(8) - 3 = 32 - 3 = 29$

$a_9 = 4(9) - 3 = 36 - 3 = 33$

$a_{10} = 4(10) - 3 = 40 - 3 = 37$

The sum of the terms = 1+ 5 + 9 + 13 + 17 + 21 + 25 + 29 + 33 + 37

Here we see the sequence is in Arithmetic Progression with the common difference 4. Thus we can use the formula to find the sum of n terms in an AP.

$S_n = n(a+l)/2$ where a and l are the first and the last terms respectively.

Here $a_1 = 1$ and $a_{10} = 37$

Thus $S_{10} = 10(1 + 37)/2$

$= 5(38)$

$= 190$

Therefore, the sum of the first 10 terms is 190.

## 8. $a_7 = n^2/2^n$

**Solution:**

The sequence is a list of numbers (or items) that exhibits a particular pattern.

Here nth term is given as $a^n = n^2/2^n$

To find $a_7$

We need to replace n with 7.

Substituting n = 7

$a_7 = 7^2/2^7$

= 49/128

## 9. $a_n = (-1)^{n-1} n^3$

**Solution:**

The sequence is a list of numbers (or items) that exhibits a particular pattern

Here nth term is given as $a_n = (-1)^{n-1} n^3$

Substituting n = 9

To find the value of $a_9$,

We need to replace n with 9.

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

= 729

## 10. $a_n = n(n - 2)/(n + 3)$; $a_{20}$

**Solution:**

The sequence is a list of numbers (or items) that exhibits a particular pattern.

nth term is given as:

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

Substituting n = 20, we get

$a_{20} = 20(20 - 2)/(20 + 3)$

= 360/23

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

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

**Solution:**

The sequence is a list of numbers (or items) that exhibits a particular pattern.

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

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

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

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

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

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

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

## 12. $a_1 = -1, a_n = a_{n-1} / n; n \geq 2$

**Solution:**

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

for all $n \geq 2$

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

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

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

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

Hence, the first five terms of the sequence are $-1, -1/2, -1/6, -1/24, -1/120$.

The corresponding series is $(-1) + (-1/2) + (-1/6) + (-1/24) + (-1/120)$ .....

## 13. $a_1 = a_2 = 2, a_n = a^{n-1} - 1, n > 2$

**Solution:**

The sequence is a list of numbers (or items) that exhibits a particular pattern.

$a_1 = a_2 = 2, a^n = a^{n-1} - 1, n > 2$

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

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

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

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

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

**14. The Fibonacci sequence is defined by $1 = a_1 = a_2$ 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:**

Here Fibonacci sequence is defined by $1 = a_1 = a_2$ and $a_n = a_{n-1} + a_{n-2}$,

$1 = a_1 = a_2$

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

Therefore,

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

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

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

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

For n = 1, $a_{1+1}/a_1$

$= a_2/a_1 = 1/1 = 1$

For n = 2, $a_{2+1}/a_2$

$= a_3/a_2 = 2/1 = 2$

For n = 3, $a_{3+1}/a_3$

$= a_4/a_3 = 3/2$

For n = 4, $a_{4+1}/a_4$

$= a_5/a_4 = 5/3$

For n = 5, $a_{5+1}/a_5$

$= a_6/a_5 = 8/5$