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Solutions

Class 10 Maths

Chapter 9

Ex 9.1

1. Write the first terms of each of the following sequences whose nth term are

(i) $a_n = 3n + 2$

(ii) $a_n = \frac{n-2}{3}$

(iii) $a_n = 3^n$

(iv) $a_n = \frac{3n-2}{5}$

(v) $a_n = (-1)^n 2^n$

(vi) $a_n = \frac{n(n-2)}{2}$

(vii) $a_n = n^2 - n + 1$

(viii) $a_n = n^2 - n + 1$

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

Sol:

We have to write first five terms of given sequences

(i) $a_n = 3n + 2$

Given sequence $a_n = 3n + 2$

To write first five terms of given sequence put n = 1, 2, 3, 4, 5, we get

$a_1 = (3 \times 1) + 2 = 3 + 2 = 5$

$a_2 = (3 \times 2) + 2 = 6 + 2 = 8$

$a_3 = (3 \times 3) + 2 = 9 + 2 = 11$

$a_4 = (3 \times 4) + 2 = 12 + 2 = 14$

$a_5 = (3 \times 5) + 2 = 15 + 2 = 17$

$\therefore$ The required first five terms of given sequence $a_n = 3n + 2$ are 5, 8, 11, 14, 17.

(ii) $a_n = \frac{n-2}{3}$

Given sequence $a_n = \frac{n-2}{3}$

To write first five terms of given sequence $a_n = \frac{n-2}{3}$

put n = 1, 2, 3, 4, 5 then we get

$a_1 = \frac{1-2}{3} = \frac{-1}{3}; a_2 = \frac{2-2}{3} = 0$

$a_3 = \frac{3-2}{3} = \frac{1}{3}; a_4 = \frac{4-2}{3} = \frac{2}{3}$

$a_5 = \frac{5-2}{3} = 1$

∴ The required first five terms of given sequence $a_n = \frac{n-2}{3}$ are $\frac{-1}{3}, 0, \frac{1}{3}, \frac{2}{3}, 1$.

(iii) $a_n = 3^n$

Given sequence $a_n = 3^n$

To write first five terms of given sequence, put n = 1, 2, 3, 4, 5 in given sequence.

Then,

$a_1 = 3^1 = 3; a_2 = 3^2 = 9; a_3 = 27; a_4 = 3^4 = 81; a_5 = 3^5 = 243.$

(iv) $a_n = \frac{3n-2}{5}$

Given sequence, $a_n = \frac{3n-2}{5}$

To write first five terms, put n = 1, 2, 3, 4, 5 in given sequence $a_n = \frac{3n-2}{5}$

Then, we get

$a_1 = \frac{3\times1-2}{5} = \frac{3-2}{5} = \frac{1}{5}$

$a_2 = \frac{3\times2-2}{5} = \frac{6-2}{5} = \frac{4}{5}$

$a_3 = \frac{3\times3-2}{5} = \frac{9-2}{5} = \frac{7}{5}$

$a_4 = \frac{3\times4-2}{5} = \frac{12-2}{5} = \frac{10}{5}$

$a_5 = \frac{3\times5-2}{5} = \frac{15-2}{5} = \frac{13}{5}$

∴ The required first five terms are $\frac{1}{5}, \frac{4}{5}, \frac{7}{5}, \frac{10}{5}, \frac{13}{5}$

(v) $a_n = (-1)^n 2^n$

Given sequence is $a_n = (-1)^n 2^n$

To get first five terms of given sequence an, put n = 1, 2, 3, 4, 5.

$a_1 = (-1)^1.2^1 = (-1).2 = -2$

$a_2 = (-1)^2.2^2 = (-1).4 = 4$

$a_3 = (-1)^3.2^3 = (-1).8 = -8$

$a_4 = (-1)^4.2^4 = (-1).16 = 16$

$a_5 = (-1)^5.2^5 = (-1).32 = -32$

∴ The first five terms are -2, 4, -8, 16, -32.

(vi) $a_n = \frac{n(n-2)}{2}$

The given sequence is, $a_n = \frac{n(n-2)}{2}$

To write first five terms of given sequence $a_n = \frac{n(n-2)}{2}$

Put n = 1, 2, 3, 4, 5. Then, we get

$a_1 = \frac{1(1-2)}{2} = \frac{1-1}{2} = \frac{-1}{2}$

$a_2 = \frac{2(2-2)}{2} = \frac{2.0}{2} = 0$

$a_3 = \frac{3(3-2)}{2} = \frac{3.1}{2} = \frac{3}{2}$

$a_4 = \frac{4(4-2)}{2} = \frac{4.2}{2} = 4$

$a_5 = \frac{5(5-2)}{2} = \frac{5.3}{2} = \frac{15}{2}$

$\therefore$ The required first five terms are $\frac{-1}{2}, 0, \frac{3}{2}, 4, \frac{15}{2}$.

(vii) $a_n = n^2 - n + 1$

The given sequence is, $a_n = n^2 - n + 1$

To write first five terms of given sequence a_{n1} we get put n = 1, 2, 3, 4, 5. Then we get $a_1 = 1^2 - 1 + 1 = 1$

$a_2 = 2^2 - 2 + 1 = 3$

$a_3 = 3^2 - 3 + 1 = 7$

$a_4 = 4^2 - 4 + 1 = 13$

$a_5 = 5^2 - 5 + 1 = 21$

$\therefore$The required first five terms of given sequence $a_n = n^2 - n + 1$ are 1, 3, 7, 13, 21

(viii) $a_n = 2n^2 - 3n + 1$

The given sequence is $a_n = 2n^2 - 3n + 1$

To write first five terms of given sequence a_n, we put n = 1, 2, 3, 4, 5. Then we get

$a_1 = 2.1^2 - 3.1 + 1 = 2 - 3 + 1 = 0$

$a_2 = 2.2^2 - 3.2 + 1 = 8 - 6 + 1 = 3$

$a_3 = 2.3^2 - 3.3 + 1 = 18 - 9 + 1 = 10$

$a_4 = 2.4^2 - 3.4 + 1 = 32 - 12 + 1 = 21$

$a_5 = 2.5^2 - 3.5 + 1 = 50 - 15 + 1 = 36$

$\therefore$ The required first five terms of given sequence $a_n = 2n^2 - 3n + 1$ are 0, 3, 10, 21, 36

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

Given sequence is, $a_n = \frac{2n-3}{6}$

To write first five terms of given sequence we put n = 1, 2, 3, 4, 5. Then, we get,

$a_1 = \frac{2.1-3}{6} = \frac{2-3}{6} = \frac{-1}{6}$

$a_2 = \frac{2.2-3}{6} = \frac{4-3}{6} = \frac{1}{6}$

$a_3 = \frac{2.4-3}{6} = \frac{8-3}{6} = \frac{5}{6}$

$a_4 = \frac{2.4-3}{6} = \frac{8-3}{6} = \frac{5}{6}$

$a_5 = \frac{2.5-3}{6} = \frac{10-3}{6} = \frac{7}{6}$

$\therefore$ The required first five terms of given sequence $a_n = \frac{2n-3}{6}$ are $\frac{-1}{6}, \frac{1}{6}, \frac{1}{2}, \frac{5}{6}, \frac{7}{6}$.

2. Find the indicated terms in each of the following sequences whose nth terms are:

(i) $a_n = 5n - 4; a_{12}\ and\ a_{15}$

(ii) $a_n = \frac{3n-2}{4n+5}; a_7\ and\ a_8$

(iii) $a_n = n(n-1)(n-2); a_5\ and\ a_8$

(iv) $a_n = (n-1)(2-n)(3+n); a_{11}\ a_{21}\ a_3$

(v) $a_n = (-1)^n n; a_3, a_5, a_8$

Sol:

We have to find the required term of a sequence when nth term of that sequence is given.

(i) $a_n = 5n - 4; a_{12}\ and\ a_{15}$

Given nth term of a sequence $a_n = 5n - 4$

To find 12th term, 15th terms of that sequence, we put n = 12, 15 in its nth term.

Then, we get

$a_{12} = 5.12 - 4 = 60 - 4 = 56$

$a_{15} = 5.15 - 4 = 15 - 4 = 71$

∴ The required terms $a_{12} = 56, a_{15} = 71$

(ii) $a_n = \frac{3n-2}{4n+5}; a_7\ and\ a_8$

Given nth term is (a_n) = $\frac{3n-2}{4n+5}$

To find 7th, 8th terms of given sequence, we put n = 7, 8.

$a_7 = \frac{(3.7)-2}{(4.7)+5} = \frac{19}{33}$

$a_8 = \frac{(3.8)-2}{(4.8)+5} = \frac{22}{37}$

∴ The required terms $a_7 = \frac{19}{33}$ and $a_8 = \frac{22}{37}$.

(iii) $a_n = n(n-1)(n-2); a_5\ and\ a_8$

Given nth term is $a_n = n(n-1)(n-2)$

To find 5th, 8th terms of given sequence, put n= 5, 8 in an then, we get

$a_5 = 5(5-1).(5-2) = 5.4.3 = 60$

$a_8 = 8.(8-1).(8-2) = 8.7.6 = 336$

∴ The required terms are $a_5 = 60\ and\ a_8 = 336$

(iv) $a_n = (n-1)(2-n)(3+n); a_{11}\ a_{21}\ a_3$

The given nth term is $a_n = (n+1)(2-n)(3+n)$

To find a_1, a_2, a_3 of given sequence put n = 1, 2, 3 is an

$a_1 = (1-1)(2-1)(3+1) = 0.1.4 = 0$

$a_2 = (2-1)(2-2)(3+2) = 1.0.5 = 0$

$a_3 = (3-1)(2-3)(3+3) = 2.-1.6 = -12$

∴ The required terms $a_1 = 0,\ a_2 = 0,\ a_3 = -12$

(v) $a_n = (-1)^n n; a_3, a_5, a_8$

The given nth term is, $a_n = (-1)^n.n$

To find $a_3.a_5, a_8$ of given sequence put n = 3, 5, 8, in a_n.

$a_3 = (-1)^3.3 = -1.3 = -3$
$a_5 = (-1)^5.5 = -1.5 = -5$
$a_8 = (-1)^8 = 1.8 = 8$
$\therefore$ The required terms $a_3 = -3, a_5 = -5, a_8 = 8$

3. Find the next five terms of each of the following sequences given by:
   (i) $a_1 = 1, a_n = a_{n-1} + 2,\ n \geq 2$
   (ii) $a_1 = a_2 = 2, a_n = a_{n-1} - 3, n > 2$
   (iii) $a_1 = -1, a_n = \frac{a_n - 1}{n}, n \geq 2$
   (iv) $a_1 = 4, a_n = 4\, a_{n-1} + 3, n > 1$

Sol:
We have to find next five terms of following sequences.

(i) $a_1 = 1, a_n = a_{n-1} + 2,\ n \geq 2$
Given, first term (a_1) = 1,
n^{th} term $a_n = a_{n-1} + 2, n \geq 2$
To find 2^{nd}, 3^{rd}, 4^{th}, 5^{th}, 6^{th} terms, we use given condition $n \geq 2$ for n^{th} term $a_n = a_{n-1} + 2$
$a_2 = a_{2-1} + 2 = a_1 + 2 = 1 + 2 = 3\ (\because a_1 = 1)$
$a_3 = a_{3-1} + 2 = a_2 + 2 = 3 + 2 = 5$
$a_4 = a_{4-1} + 2 = a_3 + 2 = 5 + 2 = 7$
$a_5 = a_{5-1} + 2 = a_4 + 2 = 7 + 2 = 9$
$a_6 = a_{6-1} + 2 = a_5 + 2 = a + 2 = 11$
$\therefore$ The next five terms are,
$a_2 = 3, a_3 = 5, a_4 = 7, a_5 = a, a_6 = 11$

(ii) $a_1 = a_2 = 2, a_n = a_{n-1} - 3, n > 2$
Given,
First term $(a_1) = 2$
Second term $(a_2) = 2$
n^{th} term $(a_n) = a_{n-1} - 3$
To find next five terms i.e., a_3, a_4, a_5, a_6, a_7 we put n = 3, 4, 5, 6, 7 is a_n
$a_3 = a_{3-1} - 3 = 2 - 3 = -1$
$a_4 = a_{4-1} - 3 = a_3 - 3 = -1 - 3 = -4$
$a_5 = a_{5-1} - 3 = a_4 - 3 = -4 - 3 = -7$
$a_6 = a_{6-1} - 3 = a_5 - 3 = -7 - 3 = -10$
$a_7 = a_{7-1} - 3 = a_6 - 3 = -10 - 3 = -13$
$\therefore$ The next five terms are, $a_3 = -1, a_4 = -4, a_5 = -7, a_6 = -10, a_7 = -13$

(iii) $a_1 = -1, a_n = \frac{a_n - 1}{n}, n \geq 2$
Given, first term $(a_1) = -1$

n^{th} term $(a_n) = \frac{a_{n-1}}{n}, n \geq 2$

To find next five terms i.e., a_2, a_3, a_4, a_5, a_6 we put n = 2, 3, 4, 5, 6 is an

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

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

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

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

∴ The next five terms are,

$a_2 = \frac{-1}{2}, a_3 = \frac{-1}{6}, a_4 = \frac{-1}{24}, a_5 = \frac{-1}{120}, a_6 = \frac{-1}{720}$

(iv) $a_1 = 4, a_n = 4\, a_{n-1} + 3, n > 1$

Given,

First term $(a_1) = 4$

n^{th} term $(a_n) = 4\, a_{n-1} + 3$, n > 1

To find next five terms i.e., a_2, a_3, a_4, a_5, a_6 we put n= 2, 3, 4, 5, 6 is a_n

Then, we get

$a_2 = 4a_{2-1} + 3 = 4.a_1 + 3 = 4.4 + 3 = 19\ (\because a_1 = 4)$

$a_3 = 4a_{3-1} + 3 = 4.a_2 + 3 = 4(19) + 3 = 79$

$a_4 = 4\, a_{4-1} + 3 = 4.a_3 + 3 = 4(79) + 3 = 319$

$a_5 = 4\, a_{5-1} + 3 = 4.a_4 + 3 = 4(319) + 3 = 1279$

$a_6 = 4.a_{6-1} + 3 = 4.a_5 + 3 = 4(1279) + 3 = 5119$

∴ The required next five terms are,

$a_2 = 19, a_3 = 79, a_4 = 319, a_5 = 1279, a_6 = 5119$