

Exercise 10(A)

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1. Which of the following sequences are in arithmetic progression?

(i) 2, 6, 10, 14,

(ii) 15, 12, 9, 6,

(iii) 5, 9, 12, 18,

(iv) $1/2, 1/3, 1/4, 1/5, \dots$

Solution:

(i) 2, 6, 10, 14,

Finding the difference between the terms,

$$d_1 = 6 - 2 = 4$$

$$d_2 = 10 - 6 = 4$$

$$d_3 = 14 - 10 = 4$$

As $d_1 = d_2 = d_3$, the given sequence is in arithmetic progression.

(ii) 15, 12, 9, 6,

Finding the difference between the terms,

$$d_1 = 12 - 15 = -3$$

$$d_2 = 9 - 12 = -3$$

$$d_3 = 6 - 9 = -3$$

As $d_1 = d_2 = d_3$, the given sequence is in arithmetic progression.

(iii) 5, 9, 12, 18,

Finding the difference between the terms,

$$d_1 = 9 - 5 = 4$$

$$d_2 = 12 - 9 = 3$$

$$d_3 = 18 - 12 = 6$$

As $d_1 \neq d_2 \neq d_3$, the given sequence is not in arithmetic progression.

(iv) $1/2, 1/3, 1/4, 1/5, \dots$

Finding the difference between the terms,

$$d_1 = 1/3 - 1/2 = -1/6$$

$$d_2 = 1/4 - 1/3 = -1/12$$

$$d_3 = 1/5 - 1/4 = -1/20$$

As $d_1 \neq d_2 \neq d_3$, the given sequence is not in arithmetic progression.

2. The n^{th} term of sequence is $(2n - 3)$, find its fifteenth term.

Solution:

Given, n^{th} term of sequence is $(2n - 3)$

So, the 15^{th} term is when $n = 15$

$$t_{15} = 2(15) - 3 = 30 - 3 = 27$$

Thus, the 15^{th} term of the sequence is 27.

3. If the p^{th} term of an A.P. is $(2p + 3)$; find the A.P.

Solution:

Given, p^{th} term of an A.P. = $(2p + 3)$

So, on putting $p = 1, 2, 3, \dots$, we have

$$t_1 = 2(1) + 3 = 5$$

$$t_2 = 2(2) + 3 = 7$$

$$t_3 = 2(3) + 3 = 9$$

.....

Hence, the sequence A.P. is 5, 7, 9, ...

4. Find the 24th term of the sequence:

12, 10, 8, 6,.....

Solution:

Given sequence,

12, 10, 8, 6,.....

The common difference:

$$10 - 12 = -2$$

$$8 - 10 = -2$$

$$6 - 8 = -2 \dots$$

So, the common difference(d) of the sequence is -2 and $a = 12$.

Now, the general term of this A.P. is given by

$$t_n = a + (n - 1)d = 12 + (n - 1)(-2) = 12 - 2n + 2 = 14 - 2n$$

For 24th term, $n = 24$

$$t_n = 14 - 2(24) = 14 - 48 = -34$$

Therefore, the 24th term is -34

5. Find the 30th term of the sequence:

$1/2, 1, 3/2, \dots$

Solution:

Given sequence,

$1/2, 1, 3/2, \dots$

So,

$$a = 1/2$$

$$d = 1 - 1/2 = 1/2$$

We know that,

$$t_n = a + (n - 1)d$$

Hence, the 30th term will be

$$t_{30} = 1/2 + (30 - 1)(1/2) = 1/2 + 29/2 = 30/2 = 15$$

Therefore, the 30th term is 15.

6. Find the 100th term of the sequence:

$\sqrt{3}, 2\sqrt{3}, 3\sqrt{3}, \dots$

Solution:

Given A.P. is $\sqrt{3}, 2\sqrt{3}, 3\sqrt{3}, \dots$

So,

$$a = \sqrt{3}$$

$$d = 2\sqrt{3} - \sqrt{3} = \sqrt{3}$$

The general term is given by,

$$t_n = a + (n - 1)d$$

For 100th term

$$t_{100} = \sqrt{3} + (100 - 1)\sqrt{3} = \sqrt{3} + 99\sqrt{3} = 100\sqrt{3}$$

Therefore, the 100th term of the given A.P. is $100\sqrt{3}$.

7. Find the 50th term of the sequence:

$1/n, (n+1)/n, (2n+1)/n, \dots$

Solution:

Given sequence,

$1/n, (n+1)/n, (2n+1)/n, \dots$

So,

$$a = 1/n$$

$$d = (n+1)/n - 1/n = (n+1-1)/n = 1$$

Then, the general term is given by

$$t_n = a + (n - 1)d$$

For 50th term, $n = 50$

$$t_{50} = 1/n + (50 - 1)1 = 1/n + 49 = (49n + 1)/n$$

Hence, the 50th term of the given sequence is $(49n + 1)/n$.

8. Is 402 a term of the sequence: 8, 13, 18, 23,.....?

Solution:

Give sequence, 8, 13, 18, 23,.....

$$d = 13 - 8 = 5 \text{ and } a = 8$$

So, the general term is given by

$$t_n = a + (n - 1)d$$

$$t_n = 8 + (n - 1)5 = 8 + 5n - 5 = 3 + 5n$$

Now,

If 402 is a term of the sequence whose n^{th} is given by $(3 + 5n)$ then n must be a non-negative integer.

$$3 + 5n = 402$$

$$5n = 399$$

$$n = 399/5$$

So, clearly n is a fraction.

Thus, we can conclude that 402 is not a term of the given sequence.

9. Find the common difference and 99th term of the arithmetic progression:

$7\frac{3}{4}, 9\frac{1}{2}, 11\frac{1}{4}, \dots$

Solution:

Given, A.P, $7\frac{3}{4}, 9\frac{1}{2}, 11\frac{1}{4}, \dots, 19\frac{1}{2}, 45\frac{1}{4}, \dots$
 i.e., $31/4, \dots$

So,

$$a = 31/4$$

$$\text{Common difference, } d = 19\frac{1}{2} - 31/4 = (38 - 31)/4 = 7/4$$

Then the general term of the A.P

$$t_n = a + (n - 1)d$$

$$t_{99} = (31/4) + (99 - 1) \times (7/4)$$

$$= (31/4) + 93 \times (7/4)$$

$$= (31/4) + (686/4)$$

$$= (31 + 686)/4$$

$$= (717)/4$$

$$= 179\frac{1}{4}$$

Hence, the 99th term of A.P. is $179\frac{1}{4}$

10. How many terms are there in the series :

(i) 4, 7, 10, 13,, 148?

(ii) 0.5, 0.53, 0.56,, 1.1?

(iii) $3/4, 1, 1\frac{1}{4}, \dots, 3$?

Solution:

(i) Given series, 4, 7, 10, 13,, 148

Here,

$$a = 4 \text{ and } d = 7 - 4 = 3$$

So, the given term is given by $t_n = 4 + (n - 1)3 = 4 + 3n - 3$

$$t_n = 1 + 3n$$

Now,

$$148 = 1 + 3n$$

$$147 = 3n$$

$$n = 147/3 = 49$$

Thus, there are 49 terms in the series.

(ii) Given series, 0.5, 0.53, 0.56,, 1.1

Here,

$$a = 0.5 \text{ and } d = 0.53 - 0.5 = 0.03$$

So, the given term is given by $t_n = 0.5 + (n - 1)0.03 = 0.5 + 0.03n - 0.03$

$$t_n = 0.47 + 0.03n$$

Now,

$$1.1 = 0.47 + 0.03n$$

$$1.1 - 0.47 = 0.03n$$

$$n = 0.63/0.03 = 21$$

Thus, there are 21 terms in the series.

(iii) Given series, $3/4, 1, 1\frac{1}{4}, \dots, 3$

Here,

$$a = 3/4 \text{ and } d = 1 - 3/4 = 1/4$$

So, the given term is given by $t_n = 3/4 + (n - 1)1/4 = (3 + n - 1)/4$

$$t_n = (2 + n)/4$$

Now,

$$3 = (2 + n)/4$$

$$12 = 2 + n$$

$$n = 10$$

Thus, there are 10 terms in the series.

