Chapter-Arithmetic Progressions
Question bank

Q1.

What is the common difference of an A.P. in which $a_{21} - a_7 = 84$?

Q2.

Find the common difference of the Arithmetic Progression (A.P.)

$$\frac{1}{a}, \frac{3-a}{3a}, \frac{3-2a}{3a}, \ldots (a \neq 0)$$

Q3.

How many two digits numbers are divisible by 3?

Q4.

For what value of k will $k + 9$, $2k - 1$ and $2k + 7$ are the consecutive terms of an A.P.?

Q5.

In an AP, if the common difference (d) $= -4$ and the seventh term (a_7) is 4, then find the first term.

Q6.

Find the 9th term from the end (towards the first term) of the A.P. 5, 9, 13, ….. , 185.

Q7.

Find the sum of first 8 multiples of 3.

Q8.

Which term of the A.P. 8, 14, 20, 26, ... will be 72 more than its 41^{st} term?

Q9.

How many terms of the A.P. 27, 24, 21, ... should be taken so that their sum is zero?

Q10.

The first term of an A.P. is 5, the last term is 45 and the sum of all its terms is 400. Find the number of terms and the common difference of the A.P.

Solution 1.

Given, $a_{21} - a_7 = 84$

$\Rightarrow (a + 20d) - (a + 6d) = 84$

$\Rightarrow a + 20d - a - 6d = 84$

$\Rightarrow 20d - 6d = 84$

$\Rightarrow 14d = 84$

$\Rightarrow d = \frac{84}{14} = 6$

Hence common difference = 6

Solution 2.

Given, A.P. is $\frac{1}{a}, \frac{3-a}{3a}, \frac{3-2a}{3a}, \ldots\ldots.$

$$d = \frac{3-a}{3a} - \frac{1}{a}$$

$$= \frac{3-a-3}{3a}$$

$$= \frac{-a}{3a} = \frac{-1}{3}$$

Solution 3.

The two-digit numbers divisible by 3 are

$$12, 15, 18, \ldots\ldots. 99$$

This is an A.P. in which $a = 12, d = 3, a_n = 99$

$$\because \quad a_n = a + (n-1)d$$

$$\therefore \quad 99 = 12 + (n-1) \times 3$$

$$87 = (n-1) \times 3$$

or $\quad n - 1 = \dfrac{87}{3} = 29$

or $\quad n = 30$

So, there are 30 two-digit numbers divisible by 3.

Solution 4.

We have, $k + 9$, $2k - 1$ and $2k + 7$ as consecutive terms of an A.P

Then, $2(2k-1) = k + 9 + 2k + 7$

$$4k - 2 = 3k + 16$$

$$\Rightarrow \quad k = 18$$

Solution 5.

Given, $d = -4$

and $\quad a_7 = 4$

$$\Rightarrow \quad a + 6d = 4$$

$$a + 6(-4) = 4$$

$$a - 24 = 4$$

a=28

Solution 6.

Given, A.P. is 5, 9, 13, ... , 185

$l = 185$ and $d = 5 - 9 = 9 - 13 = -4$

then, $l_9 = l + (n-1)d$

$= 185 + (9-1)(-4)$

$= 185 + 8(-4)$

$\therefore \quad l_9 = 153$

Solution 7.

First 8 multiples of 3 are
3, 6, 9 .... 21, 24.
We can observe that the above series is an AP with $a = 3$, $d = 6 - 3 = 3$, $n = 8$
Sum of n terms of an A.P. is given by,

$$S_n = \frac{n}{2}[2a + (n-1)d]$$

$$\therefore \quad S_8 = \frac{8}{2}[2 \times 3 + (8-1)(3)]$$

$$= 4[6 + 7 \times 3]$$

$$= 4\,[6 + 21]$$

$$= 4 \times 27$$

$$\Rightarrow \quad S_8 = 108$$

Solution 8.

A.P. is 8, 14, 20, 26, ...

$$a = 8, d = 14 - 8 = 6$$

Let $\quad a_n = a_{41} + 72$

$\Rightarrow \quad a + (n-1)d = a + 40d + 72$

$\Rightarrow \quad (n-1)\,6 = 40 \times 6 + 72$

$\quad = 240 + 72$

$\Rightarrow \quad n - 1 = \dfrac{312}{6} = 52$

$\Rightarrow \quad n = 52 + 1 = 53^{\text{rd}}$ term

Solution 9.

Given, A.P. is 27, 24, 21, ...

We have, $a = 27, d = 24 - 27 = 21 - 24 = -3$

Now, $S_n = 0$

Therefore, $\quad S_n = \dfrac{n}{2}[2a + (n-1)d] = 0$

$\Rightarrow \dfrac{n}{2}[2\,(27) + (n-1)(-3)] = 0$

$\Rightarrow \quad 54 - 3n + 3 = 0$

$\Rightarrow \quad 57 - 3n = 0$

$\Rightarrow \quad 3n = 57$

$\therefore \quad n = 19$

Hence, the no. of terms are 19.

Solution 10.

Given, $a = 5$, $a_n = 45$, $S_n = 400$

We have, $S_n = \frac{n}{2}[a + a_n]$

$\Rightarrow$ $400 = \frac{n}{2}[5 + 45]$

$\Rightarrow$ $400 = \frac{n}{2}[50]$

$\Rightarrow$ $25n = 400 \Rightarrow n = \frac{400}{25}$

$\Rightarrow$ $n = 16$

Now, $a_n = a + (n - 1)d$

$\Rightarrow$ $45 = 5 + (16 - 1)d$

$\Rightarrow$ $45 - 5 = 15d$

$\Rightarrow$ $15d = 40$

$\Rightarrow$ $d = \frac{8}{3}$

So $n = 16$ and $d = \frac{8}{3}$