

Arithmetic Progressions Ex 9.5 Q13

Answer:

(i) In this problem, we need to find the sum of all odd numbers lying between 0 and 50. So, we know that the first odd number after 0 is 1 and the last odd number before 50 is 49. Also, all these terms will form an A.P. with the common difference of 2.

So here,

First term (a) = 1

Last term (/) = 49

Common difference (d) = 2

So, here the first step is to find the total number of terms. Let us take the number of terms as n.

Now, as we know,

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

So, for the last term,

$$49 = 1 + (n-1)2$$

$$49 = 1 + 2n - 2$$

$$49 = 2n - 1$$

$$49+1=2n$$

Further simplifying,

$$50 = 2n$$

$$n = \frac{50}{2}$$

$$n = 25$$

Now, using the formula for the sum of n terms,

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

For n = 25, we get,

On further simplification, we get,

$$S_n = 25(25)$$

=625

Therefore, the sum of all the odd numbers lying between 0 and 50 is $\overline{S_{\scriptscriptstyle n}=625}$.

(ii) In this problem, we need to find the sum of all odd numbers lying between 100 and 200.

So, we know that the first odd number after 0 is 101 and the last odd number before 200 is 199.

Also, all these terms will form an A.P. with the common difference of 2.

So here,

First term (a) = 101

Last term (/) = 199

Common difference (d) = 2

So, here the first step is to find the total number of terms. Let us take the number of terms as n. Now, as we know,

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

So, for the last term,

$$199 = 101 + (n-1)2$$

$$199 = 101 + 2n - 2$$

$$199 = 99 + 2n$$

$$199 - 99 = 2n$$

Further simplifying,

$$100 = 2n$$

$$n = \frac{100}{2}$$

$$n = 50$$

Now, using the formula for the sum of n terms,

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

For n = 50, we get,

$$S_n = \frac{50}{2} [2(101) + (50 - 1)2]$$
$$= 25 [202 + (49)2]$$

$$=25(202+98)$$

$$=25(300)$$

Therefore, the sum of all the odd numbers lying between 100 and 200 is $S_n = 7500$

Arithmetic Progressions Ex 9.5 Q14

In this problem, we need to prove that the sum of all odd numbers lying between 1 and 1000 which are divisible by 3 is 83667.

So, we know that the first odd number after 1 which is divisible by 3 is 3, the next odd number divisible by 3 is 9 and the last odd number before 1000 is 999.

So, all these terms will form an A.P. 3, 9, 15, 21 ... with the common difference of 6 So here,

First term (a) = 3

Last term (/) = 999

Common difference (d) = 6

So, here the first step is to find the total number of terms. Let us take the number of terms as n.

Now, as we know

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

So, for the last term

$$999 = 3 + (n-1)6$$

$$999 = 3 + 6n - 6$$

$$999 = 6n - 3$$

$$999 + 3 = 6n$$

Further simplifying,

$$1002 = 6n$$

$$n = \frac{1002}{6}$$

$$n = 167$$

Now, using the formula for the sum of n terms,

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

For n = 167, we get,

$$S_{\pi} = \frac{167}{2} [2(3) + (167 - 1)6]$$
$$= \frac{167}{2} [6 + (166)6]$$
$$= \frac{167}{2} (6 + 996)$$
$$= \frac{167}{2} (1002)$$

On further simplification, we get,

$$S_n = 167(501)$$

$$=83667$$

Therefore, the sum of all the odd numbers lying between 1 and 1000 is $S_a = 83667$

Hence proved