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 (l) = 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 $\boxed{S_n = 625}$.

(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 (l) = 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,

$$\begin{aligned}S_n&=\frac{50}{2}\left[2(101)+(50-1)2\right]\\&=25\left[202+(49)2\right]\\&=25(202+98)\\&=25(300)\\&=7500\end{aligned}$$

Therefore, the sum of all the odd numbers lying between 100 and 200 is $\boxed{S_n=7500}$.

Arithmetic Progressions Ex 9.5 Q14

Answer :

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 (l) = 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,

$$\begin{aligned}999&=3+(n-1)6\\999&=3+6n-6\\999&=6n-3\end{aligned}$$

$999+3=6n$

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,

$$\begin{aligned}S_n&=\frac{167}{2}\left[2(3)+(167-1)6\right]\\&=\frac{167}{2}\left[6+(166)6\right]\\&=\frac{167}{2}(6+996)\\&=\frac{167}{2}(1002)\end{aligned}$$

On further simplification, we get,

$$\begin{aligned}S_n&=167(501)\\&=83667\end{aligned}$$

Therefore, the sum of all the odd numbers lying between 1 and 1000 is $\boxed{S_n=83667}$.

Hence proved

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