Arithmetic Progressions Ex 9.5 Q28

Answer :

In the given problem, let us take the first term as *a* and the common difference as *d*.

Here, we are given that,

$a_2 = 14 \quad \text{......}(1)$

$a_3 = 18 \quad \text{......}(2)$

Also, we know,

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

For the 2nd term ($n = 2$),

$a_2 = a + (2-1)d$

$14 = a + d \quad (\text{Using } 1)$

$a = 14 - d \quad \text{......}(3)$

Similarly, for the 3rd term ($n = 3$),

$a_3 = a + (3-1)d$

$18 = a + 2d \quad (\text{Using } 2)$

$a = 18 - 2d \quad \text{......}(4)$

Subtracting (3) from (4), we get,

$$a - a = (18 - 2d) - (14 - d)$$
$$0 = 18 - 2d - 14 + d$$
$$0 = 4 - d$$
$$d = 4$$

Now, to find *a*, we substitute the value of *d* in (4),

$a = 14 - 4$

$a = 10$

So, for the given A.P $d = 4$ and $a = 10$

So, to find the sum of first 51 terms of this A.P., we use the following formula for the sum of *n* terms of an A.P.,

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

Where; *a* = first term for the given A.P.

d = common difference of the given A.P.

n = number of terms

So, using the formula for *n* = 51, we get,

$$S_{51} = \frac{51}{2}\left[2(10) + (51-1)(4)\right]$$
$$= \frac{51}{2}\left[20 + (50)(4)\right]$$
$$= \frac{51}{2}\left[20 + 200\right]$$
$$= \frac{51}{2}\left[220\right]$$
$$= 51(110)$$
$$= 5610$$

Therefore, the sum of first 51 terms for the given A.P. is $\boxed{S_{51} = 5610}$.

Arithmetic Progressions Ex 9.5 Q29

Answer :

In the given problem, we need to find the sum of *n* terms of an A.P. Let us take the first term as *a* and the common difference as *d*.

Here, we are given that,

$$S_7 = 49 \qquad \text{......(1)}$$

$$S_{17} = 289 \qquad \text{......(2)}$$

So, as we know the formula for the sum of *n* terms of an A.P. is given by,

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

Where; *a* = first term for the given A.P.

d = common difference of the given A.P.

n = number of terms

So, using the formula for *n* = 7, we get,

$$S_7 = \frac{7}{2}\left[2(a) + (7-1)(d)\right]$$

$$49 = \left(\frac{7}{2}\right)\left[2a + (6)(d)\right] \qquad \text{(Using 1)}$$

$$49 = \frac{14a + 42d}{2}$$

$$49 = 7a + 21d$$

Further simplifying for *a*, we get,

$$a = \frac{49 - 21d}{7}$$

$$a = 7 - 3d \qquad \text{......(3)}$$

Also, using the formula for *n* = 17, we get,

$$S_{17} = \frac{17}{2}\left[2(a) + (17-1)(d)\right]$$

$$289 = \left(\frac{17}{2}\right)\left[2a + (16)(d)\right] \qquad \text{(Using 2)}$$

$$289 = \frac{(17)(2)a + (17)(16)d}{2}$$

$$289 = 17a + 136d$$

Further simplifying for *a*, we get,

$$a = \frac{289 - 136d}{17}$$

$$a = 17 - 8d \qquad \text{......(4)}$$

Subtracting (3) from (4), we get,

$$a - a = (17 - 8d) - (7 - 3d)$$

$$0 = 17 - 8d - 7 + 3d$$

$$0 = 10 - 5d$$

$$5d = 10$$

$$d = 2$$

Now, to find a, we substitute the value of d in (3),

$$a = 7 - 3(2)$$

$$a = 7 - 6$$

$$a = 1$$

Now, using the formula for the sum of n terms of an A.P., we get,

$$
\begin{aligned}
S_n &= \frac{n}{2}\left[2(1) + (n-1)(2)\right] \\
&= \frac{n}{2}\left[2 + 2n - 2\right] \\
&= \left(\frac{n}{2}\right)(2n) \\
&= n^2
\end{aligned}
$$

Therefore, the sum of first n terms for the given A.P. is $\boxed{S_n = n^2}$.

*********** END **********