Arithmetic Progressions Ex 9.5 Q24

Answer :

(i) Here, we are given an A.P. whose n^{th} term is given by the following expression, $a_n = 3+4n$. We need to find the sum of first 15 terms.

So, here we can find the sum of the *n* terms of the given A.P., using the formula, $S_n = \left(\frac{n}{2}\right)(a+l)$

Where, *a* = the first term

l = the last term

So, for the given A.P,

The first term (*a*) will be calculated using $n=1$ in the given equation for n^{th} term of A.P.

$$\begin{aligned} a &= 3+4(1) \\ &= 3+4 \\ &= 7 \end{aligned}$$

Now, the last term (*l*) or the n^{th} term is given

$l = a_n = 3+4n$

So, on substituting the values in the formula for the sum of *n* terms of an A.P., we get,

$$\begin{aligned} S_{15} &= \left(\frac{15}{2}\right)\left[(7)+3+4(15)\right] \\ &= \left(\frac{15}{2}\right)[10+60] \\ &= \left(\frac{15}{2}\right)(70) \\ &= (15)(35) \\ &= 525 \end{aligned}$$

Therefore, the sum of the 15 terms of the given A.P. is $\boxed{S_{15} = 525}$.

(ii) Here, we are given an A.P. whose n^{th} term is given by the following expression

We need $b_n = 5+2n$ to find the sum of first 15 terms.

So, here we can find the sum of the *n* terms of the given A.P., using the formula,

$$S_n = \left(\frac{n}{2}\right)(a+l)$$

Where, *a* = the first term

l = the last term

So, for the given A.P,

The first term (*a*) will be calculated using $n=1$ in the given equation for n^{th} term of A.P.

$$\begin{aligned} b &= 5+2(1) \\ &= 5+2 \\ &= 7 \end{aligned}$$

Now, the last term (l) or the n^{th} term is given

$l = b_n = 5 + 2n$

So, on substituting the values in the formula for the sum of n terms of an A.P., we get,

$$\begin{aligned} S_{15} &= \left(\frac{15}{2}\right)\left[(7) + 5 + 2(15)\right] \\ &= \left(\frac{15}{2}\right)[12 + 30] \\ &= \left(\frac{15}{2}\right)(42) \\ &= (15)(21) \\ &= 315 \end{aligned}$$

Therefore, the sum of the 15 terms of the given A.P. is $\boxed{S_{15} = 315}$.

(iii) Here, we are given an A.P. whose n^{th} term is given by the following expression, $x_n = 6 - n$. We need to find the sum of first 15 terms.

So, here we can find the sum of the n terms of the given A.P., using the formula,

$$S_n = \left(\frac{n}{2}\right)(a + l)$$

Where, a = the first term

l = the last term

So, for the given A.P,

The first term (a) will be calculated using $n = 1$ in the given equation for n^{th} term of A.P.

$$\begin{aligned} x &= 6 - 1 \\ &= 5 \end{aligned}$$

Now, the last term (l) or the n^{th} term is given

$l = a_n = 6 - n$

So, on substituting the values in the formula for the sum of n terms of an A.P., we get,

$$\begin{aligned} S_{15} &= \left(\frac{15}{2}\right)\left[(5) + 6 - 15\right] \\ &= \left(\frac{15}{2}\right)[11 - 15] \\ &= \left(\frac{15}{2}\right)(-4) \\ &= (15)(-2) \\ &= -30 \end{aligned}$$

Therefore, the sum of the 15 terms of the given A.P. is $\boxed{S_{15} = -30}$.

(iv) Here, we are given an A.P. whose n^{th} term is given by the following expression, $y_n = 9 - 5n$. We need to find the sum of first 15 terms.

So, here we can find the sum of the n terms of the given A.P., using the formula,

$$S_n = \left(\frac{n}{2}\right)(a + l)$$

Where, a = the first term

l = the last term

So, for the given A.P,

The first term (a) will be calculated using $n = 1$ in the given equation for n^{th} term of A.P.

$$\begin{aligned} y &= 9 - 5(1) \\ &= 9 - 5 \\ &= 4 \end{aligned}$$

Now, the last term (l) or the n^{th} term is given

$l = a_n = 9 - 5n$

So, on substituting the values in the formula for the sum of n terms of an A.P., we get,

$$\begin{aligned} S_{15} &= \left(\frac{15}{2}\right)\left[(4) + 9 - 5(15)\right] \\ &= \left(\frac{15}{2}\right)[13 - 75] \\ &= \left(\frac{15}{2}\right)(-62) \\ &= (15)(-31) \\ &= -465 \end{aligned}$$

Therefore, the sum of the 15 terms of the given A.P. is $\boxed{S_{15} = -465}$.

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