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.

$$a = 3+4(1)$$
$$= 3+4$$
$$= 7$$

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,

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

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.

$$b = 5+2(1)$$
$$= 5+2$$
$$= 7$$

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,

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

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.

$x = 6 - 1$
$= 5$

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,

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

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.

$y = 9 - 5(1)$
$= 9 - 5$
$= 4$

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,

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

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

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