



Arithmetic Progressions Ex 9.5 Q22

Answer :

In the given problem, we need to find the sum of terms for different arithmetic progressions. So, here we use the following formula for the sum of n terms of an A.P.,

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

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

d = common difference of the given A.P.

n = number of terms

(i) First 15 multiples of 8.

So, we know that the first multiple of 8 is 8 and the last multiple of 8 is 120.

Also, all these terms will form an A.P. with the common difference of 8.

So here,

First term (a) = 8

Number of terms (n) = 15

Common difference (d) = 8

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

$$S_n = \frac{15}{2} [2(8) + (15-1)8]$$

$$= \frac{15}{2} [16 + (14)8]$$

$$= \frac{15}{2} (16 + 112)$$

$$= \frac{15}{2} (128)$$

$$= 960$$

Therefore, the sum of the first 15 multiples of 8 is **960**

(a) First 40 positive integers divisible by 3

So, we know that the first multiple of 3 is 3 and the last multiple of 3 is 120.

Also, all these terms will form an A.P. with the common difference of 3.

So here,

First term (a) = 3

Number of terms (n) = 40

Common difference (d) = 3

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

$$S_n = \frac{40}{2} [2(3) + (40-1)3]$$

$$= 20 [6 + (39)3]$$

$$= 20 (6 + 117)$$

$$= 20 (123)$$

$$= 2460$$

Therefore, the sum of first 40 multiples of 3 is **2460**

(b) First 40 positive integers divisible by 5

So, we know that the first multiple of 5 is 5 and the last multiple of 5 is 200.

Also, all these terms will form an A.P. with the common difference of 5.

So here,

First term (a) = 5

Number of terms (n) = 40

Common difference (d) = 5

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

$$\begin{aligned} S_n &= \frac{40}{2} [2(5) + (40-1)5] \\ &= 20 [10 + (39)5] \\ &= 20(10 + 195) \\ &= 20(205) \\ &= 4100 \end{aligned}$$

Therefore, the sum of first 40 multiples of 3 is **4100**

(c) First 40 positive integers divisible by 6

So, we know that the first multiple of 6 is 6 and the last multiple of 6 is 240.

Also, all these terms will form an A.P. with the common difference of 6.

So here,

First term (a) = 6

Number of terms (n) = 40

Common difference (d) = 6

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

$$\begin{aligned} S_n &= \frac{40}{2} [2(6) + (40-1)6] \\ &= 20 [12 + (39)6] \\ &= 20(12 + 234) \\ &= 20(246) \\ &= 4920 \end{aligned}$$

Therefore, the sum of first 40 multiples of 3 is **4920**

(ii) All 3 digit natural number which are divisible by 13

So, we know that the first 3 digit multiple of 13 is 104 and the last 3 digit multiple of 13 is 988.

Also, all these terms will form an A.P. with the common difference of 13.

So here,

First term (a) = 104

Last term (l) = 988

Common difference (d) = 13

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,

$$988 = 104 + (n-1)13$$

$$988 = 104 + 13n - 13$$

$$988 = 91 + 13n$$

Further simplifying,

$$n = \frac{988 - 91}{13}$$

$$n = \frac{897}{13}$$

$$n = 69$$

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

$$\begin{aligned} S_n &= \frac{69}{2} [2(104) + (69-1)13] \\ &= \frac{69}{2} [208 + (68)13] \\ &= \frac{69}{2} (208 + 884) \end{aligned}$$

On further simplification, we get,

$$\begin{aligned} S_n &= \frac{69}{2} (1092) \\ &= 69(546) \\ &= 37674 \end{aligned}$$

Therefore, the sum of all the 3 digit multiples of 13 is $S_n = 37674$.

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