Arithmetic Progressions Ex 9.3 Q14

Answer :

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

Here, we are given that,

$$a_4 = 3a \qquad \ldots\ldots(1)$$

$$a_7 = 2a_3 + 1 \qquad \ldots\ldots(2)$$

We need to find *a* and *d*

So, as we know,

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

For the 4th term ($n = 4$),

$$\begin{aligned} a_4 &= a + (4-1)d \\ 3a &= a + 3d \\ 3a - a &= 3d \\ 2a &= 3d \\ a &= \frac{3}{2}d \end{aligned}$$

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

$$\begin{aligned} a_3 &= a + (3-1)d \\ &= a + 2d \end{aligned}$$

Also, for the 7th term ($n = 7$),

$$\begin{aligned} a_7 &= a + (7-1)d \\ &= a + 6d \qquad \ldots\ldots(3) \end{aligned}$$

Now, using the value of a_3 in equation (2), we get,

$$a_7 = 2(a+2d)+1$$
$$= 2a+4d+1 \qquad ......(4)$$

Equating (3) and (4), we get,

$$a+6d = 2a+4d+1$$
$$6d-4d-2a+a = +1$$
$$2d-a = +1$$
$$2d-\frac{3}{2}d = 1 \qquad \left(a=\frac{3}{2}d\right)$$

On further simplification, we get,

$$\frac{4d-3d}{2} = 1$$
$$d = (1)(2)$$
$$d = 2$$

Now, to find a,

$$a = \frac{3}{2}d$$
$$a = \frac{3}{2}(2)$$
$$a = 3$$

Therefore, for the given A.P $\boxed{d = 2, a = 3}$

Arithmetic Progressions Ex 9.3 Q15

Answer :

In the given problem, we are given 6^{th} and 8^{th} term of an A.P.

We need to find the 2^{nd} and n^{th} term

Here, let us take the first term as *a* and the common difference as *d*

We are given,

$$a_6 = 12$$

$$a_8 = 22$$

Now, we will find a_6 and a_8 using the formula $a_n = a + (n-1)d$

So,

$$a_6 = a + (6-1)d$$

$$12 = a + 5d \qquad ......(1)$$

Also,

$$a_8 = a + (8-1)d$$

$$22 = a + 7d \qquad ......(2)$$

So, to solve for *a* and *d*

On subtracting (1) from (2), we get

$$22 - 12 = (a + 7d) - (a + 5d)$$

$$10 = a + 7d - a - 5d$$

$$10 = 2d$$

$$d = \frac{10}{2}$$

$$d = 5 \qquad ......(3)$$

Substituting (3) in (1), we get

$$12 = a + 5(5)$$
$$a = 12 - 25$$
$$a = -13$$

Thus,

$$a = -13$$
$$d = 5$$

So, for the 2nd term (n = 2),

$$\begin{aligned} a_2 &= -13 + (2-1)5 \\ &= -13 + (1)5 \\ &= -13 + 5 \\ &= -8 \end{aligned}$$

For the n^{th} term,

$$\begin{aligned} a_n &= -13 + (n-1)5 \\ &= -13 + 5n - 5 \\ &= -18 + 5n \end{aligned}$$

Therefore, $\boxed{a_2 = -8, a_n = 5n - 18}$

Arithmetic Progressions Ex 9.3 Q16

Answer :

In this problem, we need to find out how many numbers of two digits are divisible by 3.
So, we know that the first two digit number that is divisible by 3 is 12 and the last two digit number divisible by 3 is 99. Also, all the terms which are divisible by 3 will form an A.P. with the common difference of 3.
So here,
First term (a) = 12
Last term (a_n) = 99
Common difference (d) = 3
So, let us take the number of terms as n
Now, as we know,

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

So, for the last term,

$$99 = 12 + (n-1)3$$
$$99 = 12 + 3n - 3$$
$$99 = 9 + 3n$$
$$99 - 9 = 3n$$

Further simplifying,

$$90 = 3n$$
$$n = \frac{90}{3}$$
$$n = 30$$

Therefore, the number of two digit terms divisible by 3 is $\boxed{30}$.

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