Example 2: Which of the following list of numbers form an AP? If they form an AP, write the next two terms :
(i) 4, 10, 16, 22, . . . (ii) 1, –1, –3, –5, . . .
(iii) 2, –2, 2, –2, 2, –2, . . . (iv) 1, 1, 1, 2, 2, 2, 3, 3, 3, . . .

Solution: (i) We have $a_2 - a_1 = 10 - 4 = 6$

$$a_3 - a_2 = 16 - 10 = 6$$

$$a_4 - a_3 = 22 - 16 = 6$$

i.e., $a_{k+1} - a_k$ is the same every time.
So, the given list of numbers forms an AP with the common difference d = 6.
The next two terms are: 22 + 6 = 28 and 28 + 6 = 34.

(ii)

$$a_2 - a_1 = -1 - 1 = -2$$

$$a_3 - a_2 = -3 - (-1) = -3 + 1 = -2$$

$$a_4 - a_3 = -5 - (-3) = -5 + 3 = -2$$

i.e., $a_{k+1} - a_k$ is the same every time.
So,the given list of numbers forms an AP with the common difference d = -2.
The next two terms are:

$$-5 + (-2) = -7 \quad \text{and} \quad -7 + (-2) = -9$$

(iii)

$$a_2 - a_1 = -2 - (2) = -2 - 2 = -4$$

$$a_3 - a_2 = 2 - (-2) = 2 + 2 = 4$$

As $a_2 - a_1 \neq a_3 - a_2$, the given list of numbers does not form an AP.

(iv)

$$a_2 - a_1 = 1 - 1 = 0$$

$$a_3 - a_2 = 1 - 1 = 0$$

$$a_4 - a_3 = 2 - 1 = 1$$

Here,$a_2 - a_1 = a_3 - a_2 \neq a_4 - a_3$.
So, the given list of numbers does not form an AP.

Example 3: Find the 10th term of the AP : 2, 7, 12, ...
Solution: Here, $a = 2$, d = 7 - 2 = 5 and $n = 10$.
We have $a_n = a + (n-1)d$

So, $a_{10} = 2 + (10-1) \cdot 5 = 2 + 45 = 47$
Therefore, the 10th term of the given AP is 47.

Example 4: Which term of the AP: 21, 18, 15, ... is –81? Also, is any term 0? Give reason for your answer.
Solution:
Here, $a = 21$, $d = 18 - 21 = -3$, and $a_n = -81$, and we have to find n.

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

We have:

$$\begin{aligned} -81 &= 21 + (n-1)(-3) \\ -81 &= 21 - 3(n-1) \\ -81 &= 24 - 3n \\ -105 &= -3n \\ \Rightarrow n &= 35 \end{aligned}$$

Therefore, the 35th term of the given AP is –81.

Next, we want to know if there is any n for which $a_n = 0$. If such an n is there, then:

$$\begin{aligned} 21 + (n-1)(-3) &= 0 \\ 3(n-1) &= 21 \\ n &= 8 \end{aligned}$$

So, the eighth term is 0.