

### Exercise 10(B)

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1. In an A.P., ten times of its tenth term is equal to thirty times of its 30<sup>th</sup> term. Find its 40<sup>th</sup> term.

**Solution:**

Given condition,

$$10 t_{10} = 30 t_{30} \text{ in an A.P.}$$

To find:  $t_{40} = ?$

We know that,

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

So,

$$10 t_{10} = 30 t_{30}$$

$$10(a + (10 - 1)d) = 30(a + (30 - 1)d)$$

$$10(a + 9d) = 30(a + 29d)$$

$$a + 9d = 3(a + 29d)$$

$$a + 9d = 3a + 87d$$

$$2a + 78d = 0$$

$$2(a + 39d) = 0$$

$$a + 39d = a + (40 - 1)d = t_{40} = 0$$

Therefore, the 40<sup>th</sup> term of the A.P. is 0

2. How many two-digit numbers are divisible by 3?

**Solution:**

The 2-digit numbers divisible by 3 are as follows:

$$12, 15, 18, 21, \dots, 99$$

It's seen that the above forms an A.P. with

$$a = 12, d = 3 \text{ and last term}(n^{\text{th}} \text{ term}) = 99$$

We know that,

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

So,

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

$$99 = 12 + 3n - 3$$

$$99 = 9 + 3n$$

$$3n = 90$$

$$n = 90/3 = 30$$

Hence, the number of 2-digit numbers divisible by 3 is 30

3. Which term of A.P. 5, 15, 25 ..... will be 130 more than its 31<sup>st</sup> term?

**Solution:**

Given A.P. 5, 15, 25, .....

$$a = 5, d = 10$$

From the question, we have

$$t_n = t_{31} + 130$$

We know that,

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

So,

$$5 + (n - 1)10 = 5 + (31 - 1)10 + 130$$

$$10n - 10 = 300 + 130$$

$$10n = 430 + 10 = 440$$

$$n = 440/10 = 44$$

Thus, the 44<sup>th</sup> term of the given A.P. is 130 more than its 31<sup>st</sup> term.

**4. Find the value of p, if x, 2x + p and 3x + 6 are in A.P**

**Solution:**

Given that,

x, 2x + p and 3x + 6 are in A.P

So, the common difference between the terms must be the same.

Hence,

$$2x + p - x = 3x + 6 - (2x + p)$$

$$x + p = x + 6 - p$$

$$2p = 6$$

$$p = 3$$

**5. If the 3<sup>rd</sup> and the 9<sup>th</sup> terms of an arithmetic progression are 4 and -8 respectively, which term of it is zero?**

**Solution:**

Given in an A.P.

$$t_3 = 4 \text{ and } t_9 = -8$$

We know that,

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

So,

$$a + (3 - 1)d = 4 \quad \text{and} \quad a + (9 - 1)d = -8$$

$$a + 2d = 4 \quad \text{and} \quad a + 8d = -8$$

Subtracting both the equations we get,

$$6d = -12$$

$$d = -2$$

Using the value of d,

$$a + 2(-2) = 4$$

$$a - 4 = 4$$

$$a = 8$$

Now,

$$t_n = 0$$

$$8 + (n - 1)(-2) = 0$$

$$8 - 2n + 2 = 0$$

$$6 = 2n$$

$$n = 3$$

Thus, the 3<sup>rd</sup> term of the A.P. is zero.

**6. How many three-digit numbers are divisible by 87?**

**Solution:**

The 3-digit numbers divisible by 87 are starting from:

174, 261, ..... , 957

This forms an A.P. with  $a = 174$  and  $d = 87$

And we know that,

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

So,

$$957 = 174 + (n - 1)87$$

$$783 = (n - 1)87$$

$$(n - 1) = 9$$

$$n = 10$$

Thus, 10 three-digit numbers are divisible by 87.

**7. For what value of  $n$ , the  $n^{\text{th}}$  term of A.P 63, 65, 67, ..... and  $n^{\text{th}}$  term of A.P. 3, 10, 17,..... are equal to each other?**

**Solution:**

Given,

A.P.<sub>1</sub> = 63, 65, 67, .....

$$a = 63, d = 2 \text{ and } t_n = 63 + (n - 1)2$$

A.P.<sub>2</sub> = 3, 10, 17, .....

$$a = 3, d = 7 \text{ and } t_n = 3 + (n - 1)7$$

Then according to the question,

$$n^{\text{th}} \text{ of A.P.}_1 = n^{\text{th}} \text{ of A.P.}_2$$

$$63 + (n - 1)2 = 3 + (n - 1)7$$

$$60 + 2n - 2 = 7n - 7$$

$$58 + 7 = 5n$$

$$n = 65/5 = 13$$

Therefore, the 13<sup>th</sup> term of both the A.P.s is equal to each other.

**8. Determine the A.P. whose 3<sup>rd</sup> term is 16 and the 7<sup>th</sup> term exceeds the 5<sup>th</sup> term by 12.**

**Solution:**

Given,

$$t_3 \text{ of an A.P.} = 16 \text{ and}$$

$$t_7 = t_5 + 12$$

We know that,

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

So,

$$t_3 = a + (3 - 1)d = 16$$

$$a + 2d = 16 \text{ ..... (i)}$$

And,

$$a + (7 - 1)d = a + (5 - 1)d + 12$$

$$6d = 4d + 12$$

$$2d = 12$$

$$d = 6$$

Using 'd' in (i) we get,

$$a + 2(6) = 16$$

$$a + 12 = 16$$

$$a = 4$$

Hence, after finding the first term = 4 and common difference = 6 the A.P. can be formed.

i.e. 4, 10, 16, 22, 28, .....

