

Lecture_03

No. **18**



ARITHMETIC PROGRESSIONS

- **Finding missing terms in given sequence**

3) In the following APs, find the missing terms in the boxes :

i) 2, , 26

Sol: $a = 2$, $a_3 = 26$,

We know

We need to find a_2 given

$$a_3 = a + 2d$$

$$\therefore 26 = 2 + 2d$$

$$\therefore 26 - 2 = 2d$$

$$\therefore 24 = 2d$$

$$\therefore \frac{24}{2} = d$$

$$\therefore 12 = d$$

Now, let's find a_2

For given value of a_3

$$a_2 = a + d$$

$$= 2 + 12$$

$$\therefore a_2 = 14$$

2, , 26

No. **19**



ARITHMETIC PROGRESSIONS

- **Finding missing terms in given sequence**

3) In the following APs, find the missing terms in the boxes :

iv) - 4, , , , , 6

Sol: $a = -4$, $a_6 = 6$ | $a_3 = a + 2d$

We know

We need to find a and a_6 are given

For given value of a_6

$$a_6 = a + 5d$$

$$\therefore 6 = -4 + 5d$$

$$\therefore 6 + 4 = 5d$$

$$\therefore 10 = 5d$$

$$\therefore 2 = d$$

$$\begin{aligned} a_2 &= a + d \\ &= -4 + 2 \end{aligned}$$

$$a_2 = -2$$

$$a_3 = 0$$

$$a_4 = a + 3d$$

$$= -4 + 3(2)$$

$$= -4 + 6$$

$$a_4 = 2$$

$$a_5 = a + 4d$$

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

$$= -4 + 8$$

$$a_5 = 4$$

Now, let's find

a_2, a_3, a_4 & a_5

-4, , , , , 6

3) In the following APs, find the missing terms in the boxes :

v) 5, , , $9\frac{1}{2}$

Sol: $a = 5$, $a_4 = 9\frac{1}{2}$
 We know $a_n = a + (n-1)d$
 $a_4 = a + 3d$
 $9\frac{1}{2} = 5 + 3d$
 $\frac{19}{2} = 5 + 3d$
 $\therefore \frac{19}{2} - 5 = 3d$
 $\therefore \frac{19 - 10}{2} = 3d$
 $\therefore \frac{9}{2} = 3d$
 $\therefore d = \frac{3}{2}$

We need a and a_4 are

For given value of a_4

$$d = 5 + \frac{3}{2} = \frac{10}{2} + \frac{3}{2} = \frac{13}{2}$$

$$a_2 = a + d = 5 + \frac{3}{2} = 5 + 3 = 8$$

\therefore

$$5, \frac{13}{2}, 8, 9\frac{1}{2}$$

No. **20**



ARITHMETIC PROGRESSIONS

- **Finding missing terms in given sequence**

3) In the following APs, find the missing terms in the boxes :

ii) , 13,

For given value of a_2

Sol: $a_2 = 13$, $a_4 = 3$

Substituting $d = -5$ in (i)

We know that,

Subtract the two equations

$$a_2 = a + d$$

$$\therefore 13 = a + d$$

$$a_4 = a + 3d$$

$$\therefore 3 = a + 3d \dots\dots(ii)$$

Subtracting (i) from (ii)

$$a + 3d = 3$$

$$\begin{array}{r} a + 3d = 3 \\ (-) a + (-) d = 13 \\ \hline \end{array}$$

$$2d = -10$$

$$d = -5$$

Since terms with variable 'a' have same coefficient and same sign

Now, let's find a_3

$$a_3 = a + 2d$$

$$= 18 + 2(-5)$$

$$= 18 - 10$$

$$a_3 = 8$$

18, 13, 8, 3

3) In the following APs, find the missing terms in the boxes :

iii) \square , 38, \square For given value of a_2

Sol: $a_2 = 38$, $a_6 = -22$

We know that,

$$a_2 = a + d$$

$$\therefore 38 = a + d$$

$$a_6 = a + 5d$$

$$\therefore -22 = a + 5d \dots\dots(ii)$$

Subtracting (i) from (ii)

$$\begin{array}{rcl} \cancel{a} + 5d & = & -22 \\ (-) \cancel{a} + (-) d & = & (-) 38 \\ \hline 4d & = & -60 \\ \hline d & = & -15 \end{array}$$

Subtract the two equations

Since terms with variable 'a' have same coefficient and same sign

Substituting $d = -15$ in (i)

$$a_3 = a + 2d$$

$$= 53 + 2(-15)$$

$$= 53 - 30$$

$$a_3 = 23$$

$$a_4 = a + 3d$$

$$= 53 + 3(-15)$$

$$= 53 - 45$$

$$a_4 = 8$$

$$a_5 = a + 4d$$

$$= 53 + 4(-15)$$

$$= 53 - 60$$

$$a_5 = -7$$

53, 38, 23, 8, -7, -22

No. **21**



ARITHMETIC PROGRESSIONS

- Sums based on ' a_n ' Formula

4) Which term of the AP 3, 8, 13, 18, ... is 78 ?

Sol: For given AP: 3, 8, 13, 18, ...

$$a = 3, \quad d = 8 - 3 = 5, \quad a_n = 78$$

We know that,

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

$$\therefore 78 = 3 + (n - 1)(5)$$

$$\therefore 78 - 3 = (n - 1) 5$$

$$\therefore 75 = (n - 1) 5$$

$$\therefore 15 = n - 1$$

$$\therefore n = 16$$

\therefore 78 is the 16th term of AP.

Lets find value of a & d and which term no. is 78

i.e. find n when $a_n = 78$

No. **22**



ARITHMETIC PROGRESSIONS

- Sums based on ' a_n ' Formula

Q.5) Find the number of terms in each of the following AP

i) 7, 13, 19, ..., 205

Sol: For given AP: 7, 13, 19, ..., 205

$$a = 7, \quad d = 13 - 7 = 6, \quad a_n = 205$$

We know that,

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

$$\therefore 205 = 7 + (n - 1)(6)$$

$$\therefore 205 - 7 = (n - 1) 6$$

$$\therefore 198 = (n - 1) 6$$

$$\therefore 33 = n - 1$$

$$\therefore n = 34$$

\therefore Number of terms in given AP are 34

We need to find no. of terms

Lets find value of a & d

i.e. find n when $a_n = 205$

Q.5) Find the number of terms in each of the following AP

ii) $18, 15\frac{1}{2}, 13, \dots, -47$

Sol: For given A.P $18, 15\frac{1}{2}, 13, \dots, -47$

$$a = 18$$

$$d = a_2 - a_1 = 15\frac{1}{2} - 18$$

$$= \frac{31}{2} - 18$$

$$= \frac{31 - 36}{2}$$

$$d = \frac{-5}{2}$$

$$a_n = -47$$

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

$$\therefore -47 = 18 + (n - 1)\left(-\frac{5}{2}\right)$$

$$-65 \times \frac{2}{-5} = \frac{-130}{-5}$$

$$-130 = (n - 1)\left(-\frac{5}{2}\right)$$

$$\therefore \frac{-130}{-5} = (n - 1)$$

$$\therefore 26 = n - 1$$

$$\therefore n = 26 + 1$$

$$\therefore n = 27$$

The given A.P has 27 terms in it.

i.e. find n when $a_n = -47$

No. **23**



ARITHMETIC PROGRESSIONS

- Sums based on ' a_n ' Formula

6) Check whether -150 is a term of the AP 11, 8, 5, 2, ...

Sol: For given AP: 11, 8, 5, 2, ...

$$a = 11, d = 8 - 11 = -3$$

We know that,

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

$$\therefore -150 = 11 + (n - 1)(-3)$$

$$\therefore -150 - 11 = (n - 1)(-3)$$

$$\therefore -161 = (n - 1)(-3)$$

$$\therefore 53.6 = n - 1$$

$$\therefore n = 54.6$$

But n is a natural number

\therefore -150 cannot be a term of the AP

We need to check whether -150 is a term of AP or not

Lets consider that -150 is a term of AP & find which term it is?

i.e. find n when $a_n = -150$

That means, -150 is 54.6 term of AP

But 'n' represents the position of a term and hence has to be a natural number

No. **24**



ARITHMETIC PROGRESSIONS

- Sums based on ' a_n ' Formula

7) Find the 31st term of an AP whose 11th term is 38 and the 16th term is 73:

Sol: For given AP: $a_{11} = 38$

We know that,

$$a_{11} = a + 10d$$

$$\therefore 38 = a + 10d \dots (i)$$

$$a_{16} = a + 15d$$

$$\therefore 73 = a + 15d \dots (ii)$$

Subtracting (i) from (ii)

$$\begin{array}{r} \cancel{a} + 15d = 73 \\ \cancel{a} + 10d = 38 \\ (-) \quad (-) \quad (-) \\ \hline 5d = 35 \\ \hline d = 7 \end{array}$$

Substituting $d = 7$ in (i)

$$a + 10(7) = 38$$

We need to find a_{31}

\therefore Subtract the two equations

Now, let's find a_{31}

Since, terms with variable 'a' has same coefficient and same sign

$$a_{31} = a + 30d$$

$$= -32 + 30(7)$$

$$= -32 + 210$$

$$\therefore a_{31} = 178$$

\therefore **31st term of AP is 178.**

8) An AP consists of 50 terms of which 3rd term is 12 and last term is 106. Find the 29th term.

Sol: For given AP: $a_3 = 12$ and $a_{50} = 106$

We know that,

$$a_3 = a + 2d$$

$$\therefore 12 = a + 2d \dots (i)$$

$$a_{50} = a + 49d$$

$$\therefore 106 = a + 49d \dots (ii)$$

Subtracting (i) from (ii)

$$\begin{array}{r} \cancel{a} + 49d = 106 \\ \cancel{(-) a} + \cancel{(-) 2d} = \cancel{(-) 12} \\ \hline 47d = 94 \\ \hline d = 2 \end{array}$$

Substituting $d = 2$ in (i)

$$a + 2(2) = 12$$

Subtract the two equations

Since, terms with variable 'a' has same coefficient and same sign

$$a_{29} = a + 28d$$

$$= 8 + 28(2)$$

$$= 8 + 56$$

$$\therefore a_{29} = 64$$

$$\therefore \text{29}^{\text{th}} \text{ term of AP is 64.}$$

No. **25**



ARITHMETIC PROGRESSIONS

- Sums based on ' a_n ' Formula

9) If the 3rd and 9th terms of an AP are 4 and -8 respectively, which term of this AP is zero.

Sol: For given AP: $a_3 = 4$ and $a_9 = -8$

We know that,

$$a_3 = a + 2d$$

$$\therefore 4 = a + 2d \dots (i)$$

$$a_9 = a + 8d$$

$$\therefore -8 = a + 8d \dots (ii)$$

Subtracting (i) from (ii)

$$\begin{array}{r} \cancel{a} + 8d = -8 \\ (-) \cancel{a} + 2d = 4 \quad (-) \\ \hline 6d = -12 \end{array}$$

$$d = -2$$

Substituting $d = -2$ in (i)

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

Subtract the two equations

Since, terms with variable 'a' has same coefficient and same sign

Now, let's find which term of this AP is 0
i.e. find 'n' when $a_n = 0$

We know that,

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

$$\therefore 0 = 4 + (n - 1)(-2)$$

$$\therefore -4 = (n - 1)(-2)$$

$$\therefore 4 = n - 1$$

$$\therefore n = 5$$

That means,
 $a_5 = 0$

\therefore Zero is the 5th term of AP.

Thank You