

Lecture_02

No. 8



ARITHMETIC PROGRESSIONS

- Rule to find the next few terms of an A.P.

Lets find a & d

a_1 a_2 a_3 a_4
1, **3,** **5,** 7,...

By adding d to a term of an AP,
we get its next term

$$a = a_1 = 1$$

$$d = a_2 - a_1 = 3 - 1 = \mathbf{2}$$

$$a_2 = a_1 + d = 1 + 2 = 3$$

$$a_3 = a_2 + d = 3 + 2 = 5$$

$$a_4 = a_3 + d = 5 + 2 = 7$$

No. 9



ARITHMETIC PROGRESSIONS

- Finding the next few terms of an A.P.

4) Which of the following are APs ? If they form an AP, find the common difference d and write the next three terms.

i) -1.2, -3.2, -5.2, -7.2, ...

In an AP difference between any two consecutive terms is constant

Sol: $a_1 = -1.2$, $a_2 = -3.2$, $a_3 = -5.2$, $a_4 = -7.2$

$$\begin{aligned} a_2 - a_1 &= -3.2 - (-1.2) \\ &= -3.2 + 1.2 \end{aligned}$$

$$\begin{aligned} a_3 - a_2 &= -5.2 - (-3.2) \\ &= -5.2 + 3.2 \end{aligned}$$

By adding d to a term of AP we get its next term

Lets find difference between consecutive terms

$$= -2$$

$$= -2$$

$$= -2$$

\therefore As difference is constant, the given list of numbers is an AP.

$$a_5 = a_4 + d$$

$$= -7.2 + (-2)$$

$$= -7.2 - 2$$

$$= -9.2$$

$$a_6 = a_5 + d$$

$$= -9.2 + (-2)$$

$$= -9.2 - 2$$

$$= -11.2$$

$$a_7 = a_6 + d$$

$$= -11.2 + (-2)$$

$$= -11.2 - 2$$

$$= -13.2$$

$d = -2$, next three terms are -9.2, -11.2 and -13.2

4) Which of the following are APs ? If they form an AP find the common difference d and write three

In an AP difference between any two consecutive terms is constant

ii) $1^2, 5^2, 7^2, 73, \dots$

Sol: $a_1 = 1^2, a_2 = 5^2, a_3 = 7^2, a_4 = 73$

a_5, a_6 & a_7

By adding d to a term of AP we get its next term

$$\begin{array}{lll} a_2 - a_1 & a_3 - a_2 & a_4 - a_3 \\ = 5^2 - 1^2 & = 7^2 - 5^2 & = 73 - 25 \\ = 25 - 1 & = 49 - 25 & = 73 - 49 \\ = 24 & = 24 & = 24 \end{array}$$

\therefore As difference is constant, the given list of numbers is an AP.

$$\begin{array}{lll} a_5 = a_4 + d & a_6 = a_5 + d & a_7 = a_6 + d \\ = 73 + 24 & = 97 + 24 & = 121 + 24 \\ = 97 & = 121 & = 145 \end{array}$$

$d = 24$, next three terms are 97, 121 and 145.

No. **10**



ARITHMETIC PROGRESSIONS

- Finding the next few terms of an A.P.

4) Which of the following are APs : If common difference d and write three

In an AP difference between any two consecutive terms is constant

iii) $3, 3 + \sqrt{2}, 3 + 2\sqrt{2}, 3 + 3\sqrt{2}, \dots$

a_5, a_6 & a_7

Sol: $a_1 = 3, a_2 = 3 + \sqrt{2}, a_3 = 3 + 2\sqrt{2}, a_4 = 3 + 3\sqrt{2}$

By adding d to a term of AP we get its next term consecutive terms

$$\begin{aligned} a_2 - a_1 &= (3 + \sqrt{2}) - 3 = \sqrt{2} \\ a_3 - a_2 &= (3 + 2\sqrt{2}) - (3 + \sqrt{2}) = \sqrt{2} \\ a_4 - a_3 &= (3 + 3\sqrt{2}) - (3 + 2\sqrt{2}) = \sqrt{2} \end{aligned}$$

\therefore As difference is constant, the given list of numbers is an AP.

$$\begin{aligned} a_5 &= a_4 + d = 3 + 3\sqrt{2} + \sqrt{2} = 3 + 4\sqrt{2} \\ a_6 &= a_5 + d = 3 + 4\sqrt{2} + \sqrt{2} = 3 + 5\sqrt{2} \\ a_7 &= a_6 + d = 3 + 5\sqrt{2} + \sqrt{2} = 3 + 6\sqrt{2} \end{aligned}$$

$d = \sqrt{2}$, next three terms are $3 + 4\sqrt{2}, 3 + 5\sqrt{2}$ & $3 + 6\sqrt{2}$

4) Which of the following are APs ? If they form an AP. find the common difference d and write three terms.

In an AP difference between any two consecutive terms is constant

iv) a, a^2, a^3, a^4, \dots

Sol: $a_1 = a, a_2 = a^2, a_3 = a^3, a_4 = a^4,$

$$\begin{array}{ll} a_2 - a_1 & a_3 - a_2 \\ = a^2 - a & = a^3 - a^2 \\ = a(a - 1) & = a^2(a - 1) \end{array}$$

Lets find difference between consecutive terms

\therefore As difference is not constant, the given list of numbers is not an AP.

No. **11**



ARITHMETIC PROGRESSIONS

- Finding the next few terms of an A.P.

4) Which of the following are APs ? If they form an AP find the common difference d and write three more terms.

In an AP difference between any two consecutive terms is constant

(v) $\sqrt{2}, \sqrt{8}, \sqrt{18}, \sqrt{32}, \dots$

Sol: $a = \sqrt{2}$ $\sqrt{4 \times 2} = \sqrt{8}$

$$a_2 - a_1 = \sqrt{8} - \sqrt{2}$$

$$= 2\sqrt{2} - \sqrt{2}$$

$$= \sqrt{2}$$

$$a_3 - a_2 = \sqrt{18} - \sqrt{8}$$

$$= 3\sqrt{2} - 2\sqrt{2}$$

$$= \sqrt{2}$$

$$a_4 - a_3 = \sqrt{32} - \sqrt{18}$$

$$= 4\sqrt{2} - 3\sqrt{2}$$

$$= \sqrt{2}$$

By adding d to a term we get a next term

As difference is constant, given list of terms is an A.P.

$$a_5 = a_4 + d$$

$$= \sqrt{32} + \sqrt{2}$$

$$= 4\sqrt{2} + \sqrt{2}$$

$$= 5\sqrt{2}$$

$$= \sqrt{50}$$

$$a_6 = a_5 + d$$

$$= \sqrt{50} + \sqrt{2}$$

$$= 5\sqrt{2} + \sqrt{2}$$

$$= 6\sqrt{2}$$

$$= \sqrt{72}$$

$$a_7 = a_6 + d$$

$$= \sqrt{72} + \sqrt{2}$$

$$= 6\sqrt{2} + \sqrt{2}$$

$$= 7\sqrt{2}$$

$$= \sqrt{98}$$

$\therefore d = \sqrt{2}$, next three terms are $\sqrt{50}$, $\sqrt{72}$, and $\sqrt{98}$.

No. **12**



ARITHMETIC PROGRESSIONS

- Finding the next few terms of an A.P. when values of 'a' and 'd' are given

5) Write the first a_1, a_2, a_3, a_4 of the A.P. with common difference 'd' and the first term 'a'.

BY ADDING 'd' TO A TERM OF AN A.P. WE GET NEXT TERM

i) $a = 10, d = 10$

Sol: $a = 10, d = 10$

Here,

$$a_1 = a = 10$$

Add 'd' to
 a_1

$$a_2 = a_1 + d = 10 + 10 = 20$$

Add 'd' to
 a_2

$$a_3 = a_2 + d = 20 + 10 = 30$$

a_3

$$a_4 = a_3 + d = 30 + 10 = 40$$

∴ **The first four terms of the A.P. are 10, 20, 30, and 40.**

5) Write the first a_1, a_2, a_3, a_4 of the common difference 'd' and the first

BY ADDING 'd' TO A TERM OF AN A.P. WE GET NEXT TERM

ii) $a = -2, d = 0$

Sol: $a = -2, d = 0$

Here,

$$a_1 = a = -2$$

Add 'd' to
 a_1

$$a_2 = a_1 + d = -2 + 0 = -2$$

Add 'd' to
 a_2

$$a_3 = a_2 + d = -2 + 0 = -2$$

Add 'd' to
 a_3

$$a_4 = a_3 + d = -2 + 0 = -2$$

\therefore **The first four terms of the A.P. are $-2, -2, -2$, and -2 .**

No. **13**



ARITHMETIC PROGRESSIONS

- **Finding the next few terms of an A.P.
when values of 'a' and 'd' are given**

5) Write the first a_1, a_2, a_3, a_4 of the A.P. with common difference 'd' and the first term 'a'.

BY ADDING 'd' TO A TERM OF AN A.P.
WE GET NEXT TERM

iii) $a = 4, d = -3$

Sol: $a = 4, d = -3$

Here ,

$$a_1 = a = 4$$

Add 'd' to
 a_1

$$a_2 = a_1 + d = 4 + (-3) = 4 - 3 = 1$$

Add 'd' to
 a_2

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

Add 'd' to
 a_3

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

\therefore **The first four terms of the A.P. are 4, 1, -2, and -5.**

5) Write the first a_1, a_2, a_3, a_4 of the A.P. with common difference 'd' and the first term 'a'.

BY ADDING 'd' TO A TERM OF AN A.P. WE GET NEXT TERM

iv) $a = -1, d = \frac{1}{2}$

Sol: $a = -1, d = \frac{1}{2}$

Here ,

$$a_1 = a = -1$$

Add 'd' to a_1

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

Add 'd' to a_2

$$a_3 = a_2 + d = \frac{-1}{2} + \frac{1}{2} = 0$$

Add 'd' to a_3

$$a_4 = a_3 + d = 0 + \frac{1}{2} = \frac{1}{2}$$

The first four terms of the A.P.

are $-1, \frac{-1}{2}, 0$ and $\frac{1}{2}$.

5) Write the first a_1, a_2, a_3, a_4 of an A.P. with common difference 'd' and the first term 'a'.

BY ADDING 'd' TO A TERM OF AN A.P. WE GET NEXT TERM

(v) $a = -1.25, d = -0.25$

Sol: $a = -1.25, d = -0.25$

$$a_1 = a = -1.25$$

Add 'd' to
 a_1

$$a_2 = a_1 + d = -1.25 + (-0.25) = -1.25 - 0.25 = -1.50$$

Add 'd' to
 a_2

$$a_3 = a_2 + d = -1.50 + (-0.25) = -1.50 - 0.25 = -1.75$$

a_3

$$a_4 = a_3 + d = -1.75 + (-0.25) = -1.75 - 0.25 = -2.00$$

**\therefore The first four terms of the A.P are
- 1.25, - 1.50, - 1.75 and - 2.00**

No. **14**



ARITHMETIC PROGRESSIONS

- Introduction of ' a_n ' formula

$a_1 \rightarrow$ **First** term

$a_2 \rightarrow$ **Second** term

$a_3 \rightarrow$ **Third** term

$a_n \rightarrow$ n^{th} term / Any term / General term
where 'n' is the term position / term number

E.g. – For 25^{th} Term, $n = 25$

For 28^{th} Term, $n = 28$

For a given AP:

We know

Replace 0 by

$$(1 - 1)$$

Replace 0 by

$$(2 - 1)$$

Replace 0 by

$$(3 - 1)$$

Replace 0 by

$$(4 - 1)$$

Replace 0 by

$$(5 - 1)$$

Replace 'a₁' by 'a'

$$0d = a + (1 - 1)d$$

Replace 'a₂' by 'a + d'

$$1d = a + (2 - 1)d$$

Replace 'a₃' by 'a + 2d'

$$2d = a + (3 - 1)d$$

Replace 'a₄' by 'a + 3d'

$$3d = a + (4 - 1)d$$

$$a_5 = a_4 + 4d = a + (5 - 1)d$$

∴ $a_n = a + (n - 1)d$ is the n^{th} term of an AP

No. **15**



ARITHMETIC PROGRESSIONS

- Sums based on ' t_n ' formula

1) Fill in the blanks in the following table, given that a is the first term, d the common difference and a_n the n th term of the AP:

i)

a	d	n	a_n
7	3	8	...

Sol: We know that,

$$\begin{aligned}a_n &= a + (n - 1) d \\&= 7 + (8 - 1)(3) \\&= 7 + 7(3) \\&= 7 + 21\end{aligned}$$

$$\therefore a_n = 28$$

We need to find a_n

a	d	n	a_n
7	3	8	28

1) Fill in the blanks in the following table, given that a is the first term, d the common difference and a_n the n th term of the AP:

ii)

a	d	n	a_n
-18	...	10	0

Sol: We know that,

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

$$\therefore 0 = -18 + (10 - 1)(d)$$

$$\therefore 0 = -18 + 9d$$

$$\therefore 18 = 9d$$

$$\therefore d = \frac{18}{9}$$

$$\therefore d = 2$$

We need to find d

a	d	n	a_n
-18	2	10	0

No. **16**



ARITHMETIC PROGRESSIONS

- Sums based on ' a_n ' formula

1) Fill in the blanks in the following table, given that a is the first term, d the common difference and a_n the n th term of the AP:

	a	d	n	a_n
iii)	-18.9	2.5	...	3.6

Sol: We know that,

We need to find n

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

$$\therefore 3.6 = -18.9 + (n - 1)(2.5)$$

$$\therefore 3.6 + 18.9 = \left(\frac{22.5}{2.5} = \frac{225}{25} = 9 \right)$$

$$\therefore 22.5 = (n - 1) 2.5$$

$$\therefore \frac{22.5}{2.5} = (n - 1)$$

$$\therefore n - 1 = 9$$

$$\therefore n = 9 + 1$$

$$\therefore \mathbf{n = 10}$$

a	d	n	a_n
-18.9	2.5	10	3.6

1) Fill in the blanks in the following table, given that a is the first term, d the common difference and a_n the n th term of the AP:

iv)

a	d	n	a_n
...	-3	18	-5

Sol: We know that,

We need to find a

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

$$\therefore -5 = a + (18 - 1) (-3)$$

$$\therefore -5 = a + (17) (-3)$$

$$\therefore -5 = a - 51$$

$$\therefore -5 + 51 = a$$

$$\therefore a = 46$$

a	d	n	a_n
46	-3	18	-5

No. **17**



ARITHMETIC PROGRESSIONS

- Sums based on ' a_n ' formula

1) Fill in the blanks in the following table, given that a is the first term, d the common difference and a_n the n th term of the AP:

v)

a	d	n	a_n
3.5	0	105	...

Sol: We know that,

$$\begin{aligned}a_n &= a + (n - 1) d \\&= 3.5 + (105 - 1)(0) \\&= 3.5 + 0\end{aligned}$$

$$\therefore a_n = 3.5$$

We need to find a_n

a	d	n	a_n
3.5	0	105	3.5

2) Choose the correct choice in the following and justify.

i) 30th term of AP: 10, 7, 4, ..., is

(A) 97 (B) 77 (C) -77 (D) -87

Sol:

$a = 10$, $d = -3$

We need to find a_{30}

For the given AP
lets find value of a & d

$$\begin{aligned}a_{30} &= a + 29d \\&= 10 + 29(-3) \\&= 10 - 87 \\&= -77\end{aligned}$$

\therefore Option (C) is correct

2) Choose the correct choice in the following and justify.

ii) 11th term of AP: $-3, \frac{-1}{2}, 2, \dots$, is

(A) 28 (B) 22 (C) 38 (D) $-\frac{1}{2}$

We need to find a_{11}

For the given AP
lets find value of a & d

Sol: $a = -3, d = \frac{-1}{2} - (-3) = \frac{-1}{2} + 3$

$$\begin{aligned} a_{11} &= a + 10d \\ &= -3 + \cancel{10}^5 \times \frac{5}{\cancel{2}} \\ &= -3 + 25 \\ &= 22 \end{aligned}$$

\therefore Option (B) is correct

Thank You