



# UDAAN



**2026**

**Arithmetic Progression**

**MATHS**

**LECTURE-4**

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# Topics *to be covered*



Sum of n terms of an A.P.

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

$$a_{100} = a + 99d$$

$$a_{200} = a + (200-1)d$$

$p^{\text{th}}$  term.  $\rightarrow$   $a_p = a + (p-1)d$

$q^{\text{th}}$  term  $\rightarrow$   $a_q = a + (q-1)d$

$m^{\text{th}}$  term  $\rightarrow$   $a_m = a + (m-1)d$

$(m-n)^{\text{th}}$  term.  $\rightarrow$   $a_{m-n} = a + (m-n-1)d$

$(m+n)^{\text{th}}$   $\rightarrow$   $a_{m+n} = a + (m+n-1)d$

$a_{mn} = a + (mn-1)d$   
 $\rightarrow$   $(mn)^{\text{th}}$  term.

#Q. If the  $p^{\text{th}}$  term of an A.P. is  $q$  and the  $q^{\text{th}}$  term is  $p$ , prove that its  $n^{\text{th}}$  term is  $(p + q - n)$ .

CBSE 2008, 17, 23

Top:  $a_n = p + q - n$

$a = p + q - 1$

$$\begin{aligned} a_n &= a + (n-1)d \\ &= p + q - 1 + (n-1)(-1) \\ &= p + q - 1 - n + 1 \\ &= p + q - n \end{aligned}$$

$a_n = p + q - n$

$$d(p-q) = q-p$$

$$d = \frac{q-p}{p-q}$$

$$d = \frac{-(p-q)}{(p-q)}$$

$d = -1$

$$a + (p-1)d = q$$

$$a + (p-1)(-1) = q$$

$$a - p + 1 = q$$

$$a_p = q$$

$$a_q = p$$

$$a + (p-1)d = q$$

$$a + (q-1)d = p$$

$$(p-1)d - (q-1)d = q-p$$

$$pd - d - qd + d = q-p$$

$$pd - qd = q-p$$

#OT

$$\begin{aligned} a_p &= q \\ a_q &= p \end{aligned}$$

$$\begin{aligned} a + (p-1)d &= q \\ a + (q-1)d &= p \end{aligned}$$

$$\begin{aligned} (p-1)d - (q-1)d &= q-p \\ pd - d - qd + d &= q-p \\ pd - qd &= q-p \\ d(p-q) &= q-p \end{aligned}$$

$$d = \frac{q-p}{p-q}$$

$$d = -\frac{(-q+p)}{(p-q)}$$

$$d = -1$$

$$a + (p-1)d = q$$

$$a + (p-1)(-1) = q$$

$$a - p + 1 = q$$

$$a = p + q - 1$$

$$\begin{aligned} a_n &= a + (n-1)d \\ &= p + q - 1 + (n-1)(-1) \\ &= p + q - 1 - n + 1 \end{aligned}$$

$$a_n = p + q - n$$

#Q. If the  $m^{\text{th}}$  term of an A.P. be  $1/n$  and  $n^{\text{th}}$  term be  $1/m$ , then show that its  $(mn)^{\text{th}}$  term is 1.

CBSE 2017

$$a_m = \frac{1}{n}, \quad a_n = \frac{1}{m}$$

$$d(m-n) = \frac{m-n}{mn}$$

$$d = \frac{\cancel{m-n}}{mn(\cancel{m-n})}$$

$$d = \frac{1}{mn}$$

$$a + (m-1)d = \frac{1}{n}$$

$$a + (m-1)\frac{1}{mn} = \frac{1}{n}$$

$$a + \frac{1}{n} - \frac{1}{mn} = \frac{1}{n}$$

$$\text{Top: } a_{mn} = 1$$

$$a = \cancel{\frac{1}{n}} - \cancel{\frac{1}{n}} + \frac{1}{mn}$$

$$a = \frac{1}{mn}$$

$$md - nd = \frac{m-n}{mn}$$

$$(m-1)d - (n-1)d = \frac{1}{n} - \frac{1}{m}$$

$$md - \cancel{d} - nd + \cancel{d} = \frac{m-n}{mn}$$

$$a + (m-1)d = \frac{1}{n}$$

$$a + (n-1)d = \frac{1}{m}$$

①

②

③

④

$$\begin{aligned} a_{mn} &= a + (mn-1)d \\ &= \frac{1}{mn} + (mn-1)\frac{1}{mn} \\ &= \cancel{\frac{1}{mn}} + 1 - \cancel{\frac{1}{mn}} \end{aligned}$$

$$a_{mn} = 1$$

H.P

#OT<sup>2</sup>

#Q. If  $m$  times the  $m^{\text{th}}$  term of an A.P. is equal to  $n$  times its  $n^{\text{th}}$  term, show that the  $(m+n)^{\text{th}}$  term of A.P. is zero. ( $m \neq n$ )

CBSE 2008, 19

$$m(a_m) = n(a_n)$$

$$m[a + (m-1)d] = n[a + (n-1)d]$$

$$m[a + md - d] = n[a + nd - d]$$

$$ma + m^2d - md = na + n^2d - nd$$

$$ma - na + m^2d - n^2d - md + nd = 0$$

$$a(m-n) + d(m^2 - n^2) + d(-m+n) = 0$$

$$a(m-n) + d(m-n)(m+n) - d(m-n) = 0$$

To show:  $a_{m+n} = 0$

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

$$(m-n)[a + d(m+n) - d] = 0$$

$$a + d(m+n) - d = \frac{0}{m-n}$$

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

$$a_{m+n} = 0$$

#Q



#Q. Which term of the A.P. 65, 61, 57, 53, ... is its first negative term?

CBSE 2023

65, 61, 57, 53, ...

$$a = 65$$

$$d = -4$$

let,  $a_n < 0$

$$a + (n-1)d < 0$$

$$65 + (n-1)(-4) < 0$$

$$65 - 4n + 4 < 0$$

$$69 - 4n < 0$$

$$69 < 4n$$

$$\frac{69}{4} < n$$

$$17.25 < n$$

$$n = 18$$

18<sup>th</sup> term is first negative term.

$$\begin{aligned} a_{18} &= a + 17d \\ &= 65 + 17(-4) \end{aligned}$$

$$= 65 - 68$$

$$a_{18} = -3$$

#Q. Which term of the sequence  $20, 19\frac{1}{4}, 18\frac{1}{2}, 17\frac{3}{4}, \dots$  is the first negative term?

#GPH



## Sum of n Terms of an A.P.



2, 6, 10, 14, 18, 22, 26, 30, 34.  $\rightarrow$  Finite A.P.

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

$S_n$  = Sum of  $n$  terms

$$S_{10} = \text{Sum of 10 terms}$$

$$S_{20} = \text{Sum of 20 terms.}$$

$$S_{100} =$$

$$a_1 + a_2 + a_3 + a_4 + \dots + a_n = S_n$$

$$a_1 + a_2 + a_3 + a_4 + a_5 + \dots + a_p = S_p$$

$$|| \quad + \dots + a_{m+n} = S_{m+n}$$

$$S_n = \frac{n}{2} [2a + (n-1)d]$$

$$S_n = \frac{n}{2} [a + \textcircled{l}] \rightarrow \textcircled{a_n}$$

$$S_{10} \rightarrow \text{last term} = \textcircled{a_{10}}$$

$$S_{20} \rightarrow \text{last term} = \textcircled{a_{20}}$$

$$S_n \rightarrow \text{last term} = \textcircled{a_n}$$

$$S_{10} = \frac{10}{2} [2a + 9d]$$

$$S_{11} = \frac{11}{2} [2a + 10d]$$

$$S_{20} = \frac{20}{2} [2a + 19d]$$

#Q. Find the sum of 20 terms of the A.P. 1, 4, 7, 10, ...

$$S_n = \frac{n}{2} [2a + (n-1)d]$$

$$S_{20} = \frac{20}{2} [2(1) + 19(3)]$$

$$= 10 [2 + 57]$$

$$= 600$$

**A**

~~590~~

**B**

600

**C**

620

**D**

640

#Q. Find the sum of first 30 terms of an A.P. whose second term is 2 and seventh term is 22.

$$S_{30} = ?$$

$$\begin{aligned} S_{30} &= \frac{30}{2} [2a + 29d] \\ &= 15 [2(-2) + 29(4)] \\ &= 15 [-4 + 116] \\ &= 15 [112] \\ &= 1680 \end{aligned}$$

$$\begin{aligned} a + u &= 2 \\ a &= -2 \end{aligned}$$

$$a_2 = 2, a_7 = 22$$

$$\boxed{a + d = 2}, \boxed{a + 6d = 22}$$

$$\begin{array}{r} a + d = 2 \quad (1) \\ a + 6d = 22 \quad (2) \\ \hline -5d = -20 \end{array}$$

$$d = 4$$

**A** 1680

**B** 160

**C** 1730

**D** NOTA

#P.L.B. →

#Q. Find the sum of first n natural numbers.

$$1+2+3+4+\dots+n.$$

**A**  $\frac{n(n+1)}{2}$

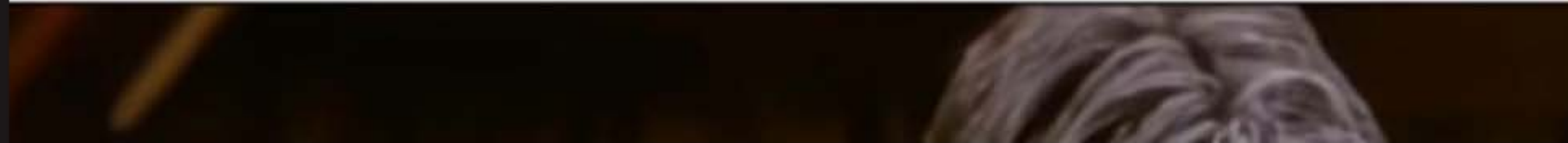
**B**  $\frac{n(n-1)}{2}$

**C**  $\frac{n^2}{2}$

**D**  $\frac{n(n+2)}{2}$

$$\begin{aligned} S_n &= \frac{n}{2}[a+l] \\ &= \frac{n}{2}[1+n] \\ &= \frac{n(n+1)}{2} \end{aligned}$$

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**( 2 chai cheeni rok ke malai thok ke)**



#Q. Find the sum of the first 15 terms of each of the following sequences having

$n^{\text{th}}$  term  $a_n = 3 + 4n$

$S_{15} = ?$

$a_n = 3 + 4n$

$a_1 = 3 + 4(1) = 7$

$a_2 = 3 + 4(2) = 11$

$d = a_2 - a_1 = 11 - 7 = 4$

$S_{15} = \frac{15}{2} [2a + (n-1)d]$

$= \frac{15}{2} [14 + 56]$

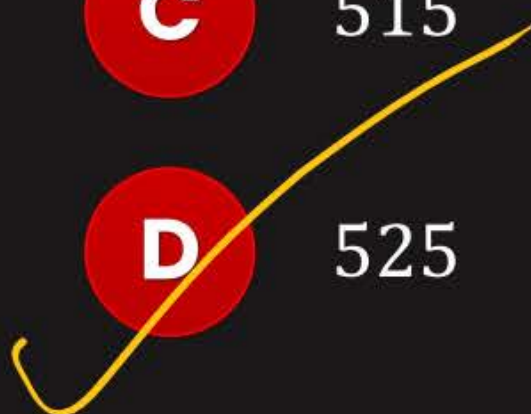
$= \frac{15}{2} \times 70 = 15 \times 35$   
 $=$

**A** 505

**B** 510

**C** 515

**D** 525



#Q. Find the sum of the first 20 terms of an A.P. whose  $n$ th term is given by  $a_n = 5 - 2n$ .

CBSE 2022

A -300

B -310

C -320

D -330

#Q. How many terms of the A.P. 27, 24, 21, ... should be taken so that their sum is zero?

$$a = 27, d = -3$$

CBSE 2016

A 17

B 18

☒ C 19

D 20

$$\text{Let } S_n = 0$$

$$\frac{n}{2} [2a + (n-1)d] = 0$$

$$n [2(27) + (n-1)(-3)] = 0$$

$$n (54 - 3n + 3) = 0$$

$$n (57 - 3n) = 0$$

$$57n - 3n^2 = 0$$

$$3n^2 - 57n = 0$$

$$3n [n - 19] = 0$$

$$3n = 0, n - 19 = 0$$

$$\cancel{n = 0}, n = 19$$



#Q. How many terms of the A.P. 45, 39, 33, ... must be taken so that their sum is 180? Explain the double answer ~~180~~

CBSE 2019, 23

A 5

B 6

C 10

D 12

$$\text{Let } S_n = 180$$

$$\frac{n}{2} [2a + (n-1)d] = 180$$

$$n [2(45) + (n-1)(-6)] = 360$$

$$n [90 - 6n + 6] = 360$$

$$n (96 - 6n) = 360$$

$$96n - 6n^2 - 360 = 0$$

$$-6 [-16n + n^2 + 60] = 0$$

$$n^2 - 16n + 60 = 0$$

$$\text{Sum} = -16 \quad p = 60$$

$$(-10, -6)$$

$$n = 10, 6$$

$$a_1 + a_2 + a_3 + a_4 + a_5 + a_6 = 180.$$

$$a_1 + a_2 + a_3 + a_4 + a_5 + a_6 + a_7 + a_8 + a_9 + a_{10} = 180.$$

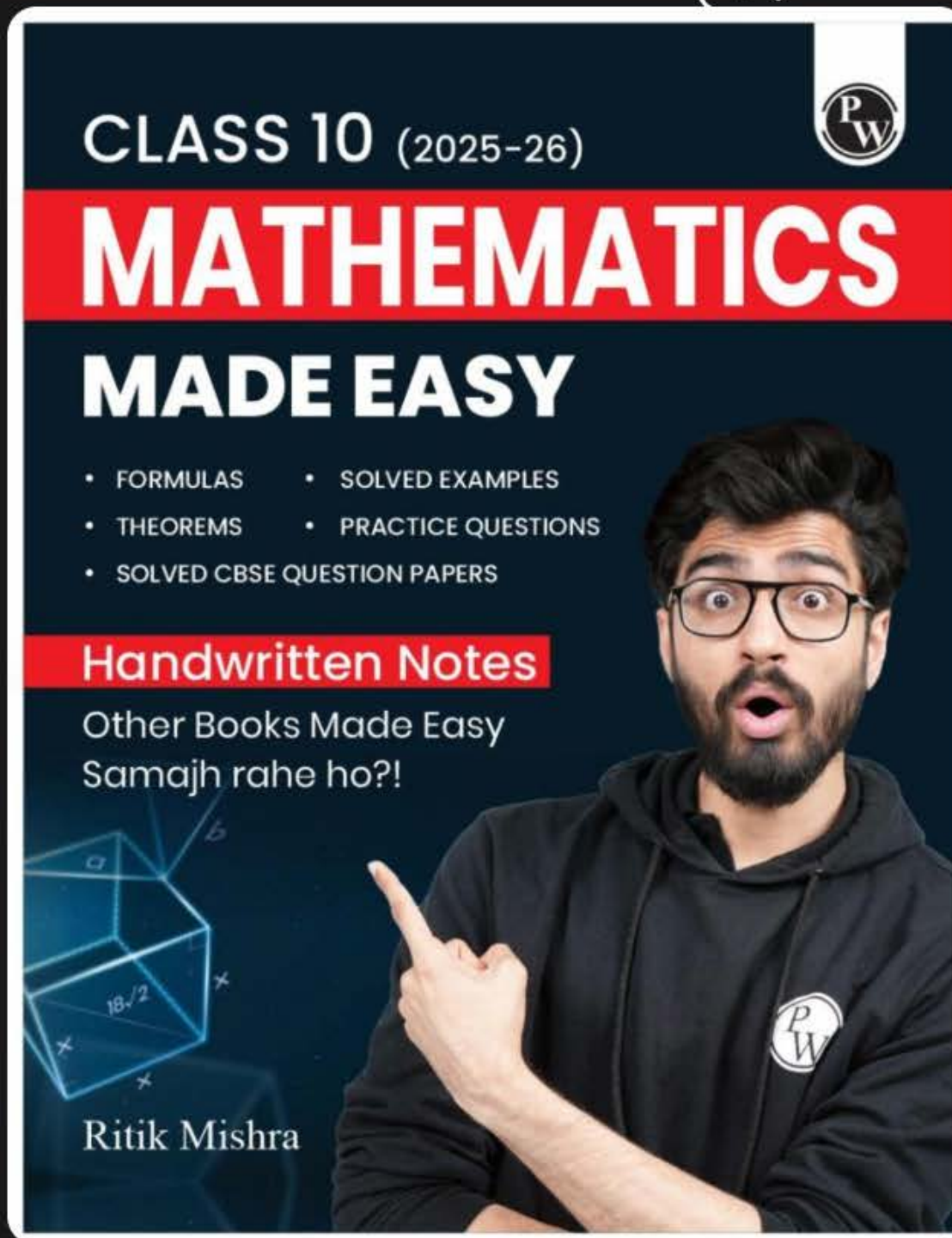
Exp: Sum from 7<sup>th</sup> till 10<sup>th</sup> term = 0.

$$\text{Sum} = 0$$

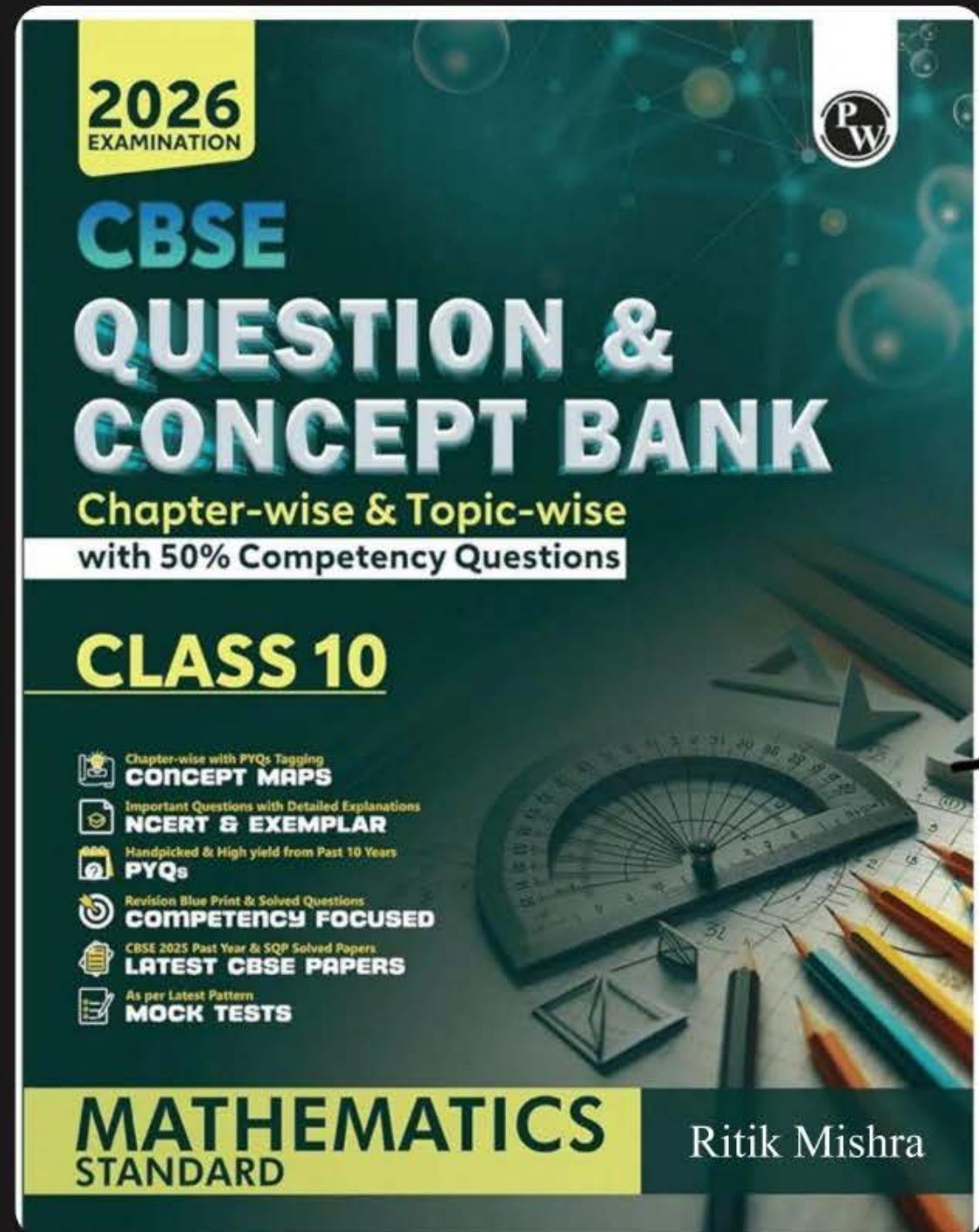
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