



# UDAAN



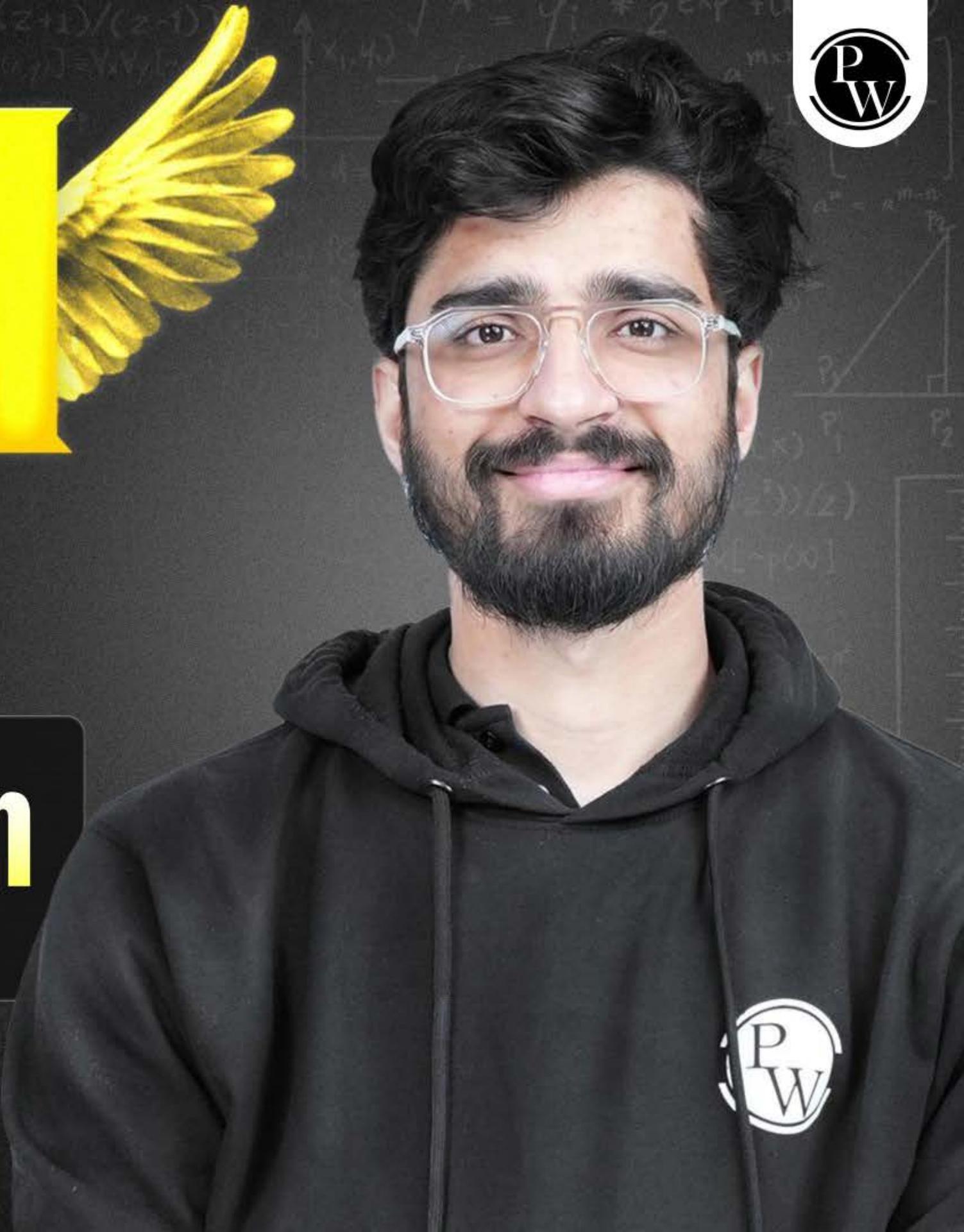
2026

Arithmetic Progression

MATHS

LECTURE-4

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# Topics *to be covered*

**A**

Sum of n terms of an A.P.

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

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

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

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

$p^{\text{th}}$   
team.

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

$q^{\text{th}}$   
team.

$a_m = a + (m-1)d$

$m^{\text{th}}$   
team.

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

$(m-n)^{\text{th}}$   
team.

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

$(m+n)^{\text{th}}$   
team.

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

$(mn)^{\text{th}}$   
team.

#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  $(p+q-n)$ .

~~HOT~~

$$a_p = q$$

$$a_q = p$$

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

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

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

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

$$pd - qd = q-p$$

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

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

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

$$d = -1$$

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

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

$$a - p + 1 = q$$

CBSE 2008, 17, 23

Top:  $a_n = p+q-n$

$a = p+q-1$

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

$$= p+q-1 - n+1$$

$a_n = p+q-n$



$$\begin{aligned} ap &= q \\ aq &= p \end{aligned}$$

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

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

$$pd - qd = q-p$$

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

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

$$d = -1$$

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

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

$$a - p + 1 = q$$

$$a = p + q - 1$$

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

$$a_n = p + q - n$$

~~HOT~~ #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.

$$a_m = \frac{1}{n}, \quad a_n = \frac{1}{m} \quad d(m-n) = \frac{m-n}{mn}$$

CBSE 2017

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

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

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

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

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

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

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

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

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

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

$$\text{To find: } a_{mn} = ?$$

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

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

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

$$a_{mn} = 1$$

H.P

#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. ( $m \neq n$ )

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

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

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

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

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

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

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

**CBSE 2008, 19**

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

$$\underline{a + (m+n-1)d = 0}$$

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

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

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

$a_{m+n} = 0$

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

65, 61, 57, 53, ...

$$a = 65$$

$$d = -4$$

Let,  $a_n < 0$

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

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

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

$$69 - 4n < 0$$

$$69 < 4n$$

$$\frac{17.25}{4} < n$$

$$17.25 < n$$

$$n = 18$$

CBSE 2023

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?

#GPU



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

2, 6, 10, 14, 18, 22, 26, 30, 34.

→ Finite A.P

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

$S_n$  = Sum of  $n$  terms

$S_{10}$  = Sum of 10 terms

$S_{20}$  = Sum of 20 terms

$S_{100}$

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

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

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

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

$$S_n = \frac{n}{2} [a + (l)]$$

an

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

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

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

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

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

$S_n \rightarrow$  last term =  $a_n$

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

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

A

~~S90.~~

B

600

C

620

D

640

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

$$= 10[2 + 57]$$

$$\textcircled{S90}$$

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

- A 1680
- B 160
- C 1730
- D NOTA

$$S_{30} = ?$$

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

=

$$a_2 = 2, a_7 = 22$$

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

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

$$a+d=2$$

$$\begin{array}{r} a+5d=22 \\ a+6d=22 \\ \hline -sd=-20 \end{array}$$

$$d=4$$

#P.L.B

P  
W

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

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

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

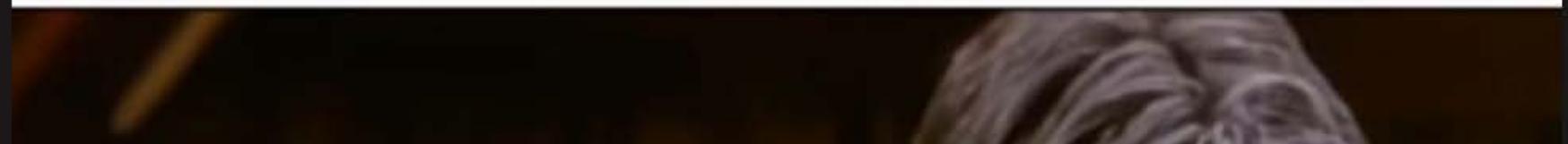
B  $\frac{n(n-1)}{2}$

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

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

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

**Dost ko starbucks lekar gaya tha  
US ne counter pe jake bol diya  
( 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<sup>th</sup> term  $a_n = 3 + 4n$

$$S_{15} = ?$$

$$a_n = 3 + 4n$$

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

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

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

A 505

B 510

C 515

D 525

$$S_{15} = \frac{15}{2} [2a + (14)d]$$

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

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

→

#Q. Find the sum of the first 20 terms of an A.P. whose nth 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

17

A

18

B

19

C

20

D

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

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

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

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

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

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

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

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

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

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



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

CBSE 2019, 23

Let  $S_n = 180$

A 5

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

B 6

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

C 10

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

D 12

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

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

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

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

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

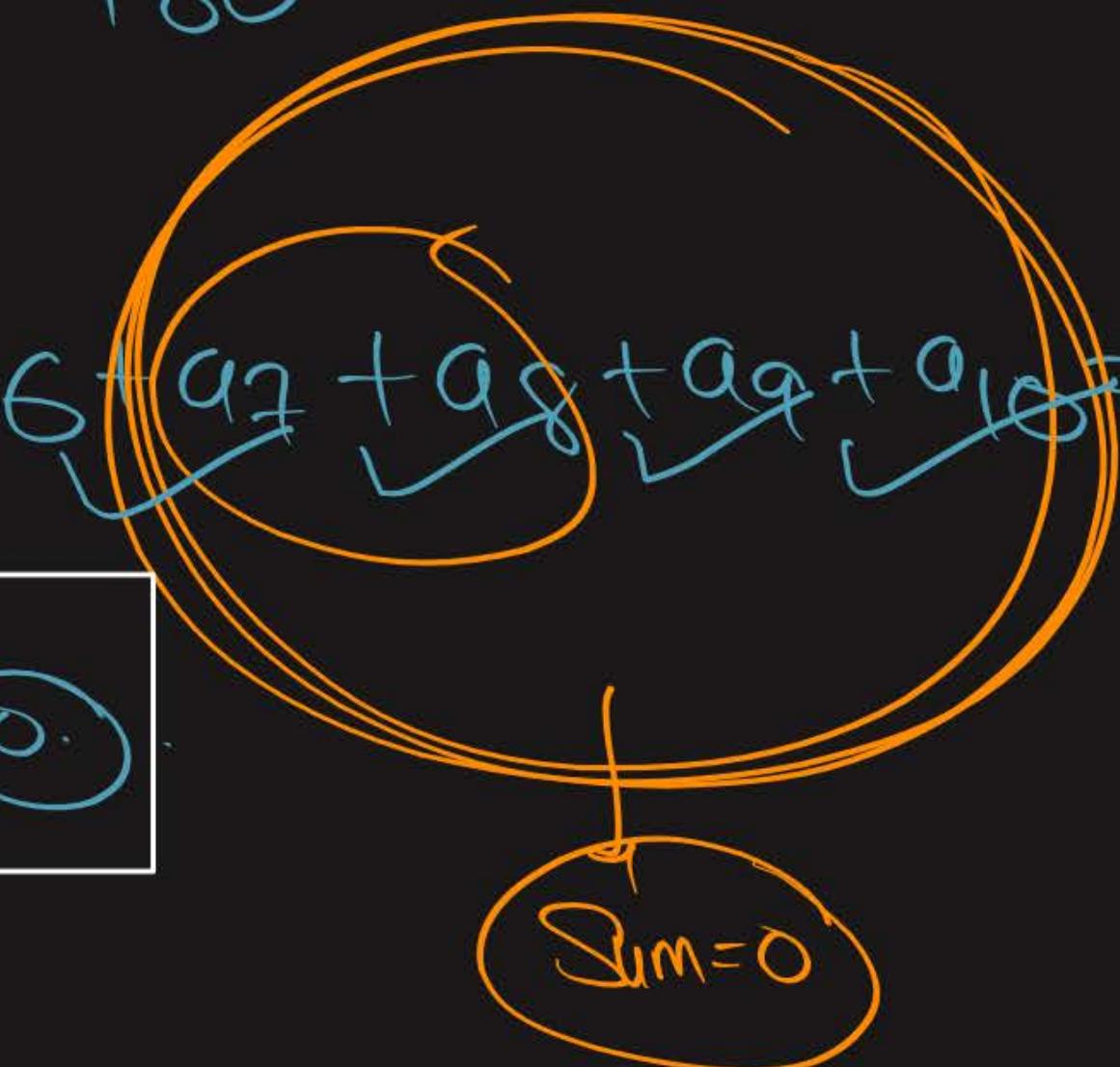
$$-10, -6$$

$$n = 10, 6$$

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

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

Ex: Sum from 7<sup>th</sup> till 10<sup>th</sup> term  
EO.



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CLASS 10 (2025-26)



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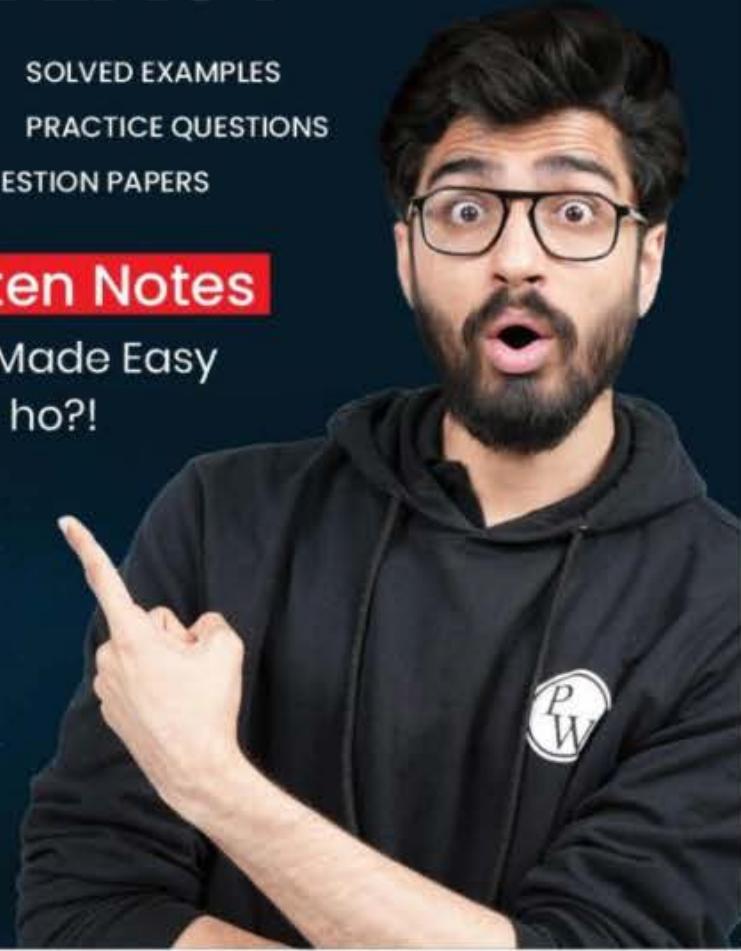
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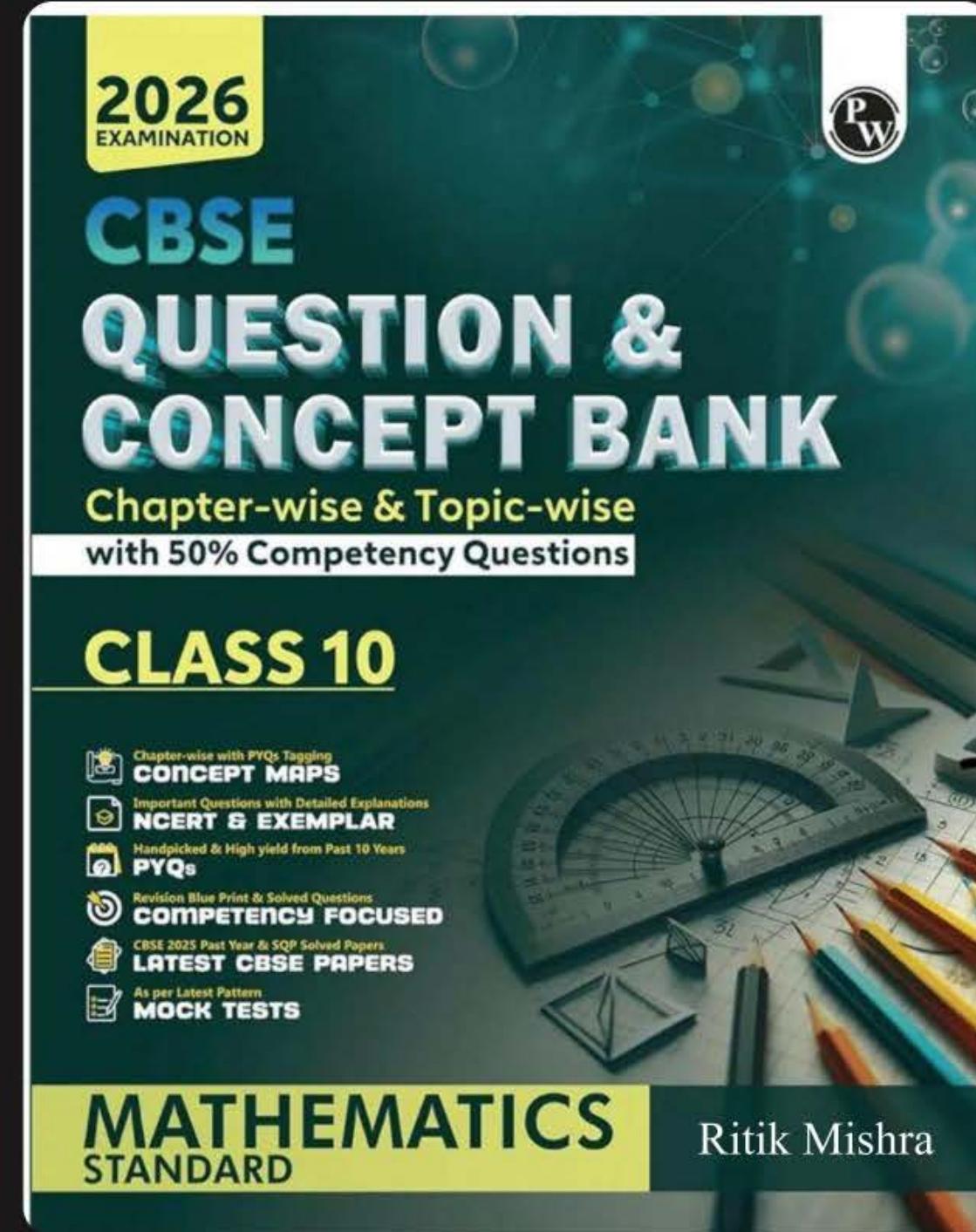


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# RITIK SIR

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