NDA 1 2025

LIVE

MATHS

PERMUTATION & COMBINATION

CLASS 2

NAVJYOTI SIR

7 Nov 2024 Live Classes Schedule

8:00AM	07 NOVEMBER 2024 DAILY CURRENT AFFAIRS	RUBY MA'AM
9:00AM	07 NOVEMBER 2024 DAILY DEFENCE UPDATES	DIVYANSHU SIR

SSB INTERVIEW LIVE CLASSES

9:30AM	OVERVIEW OF PPDT & PRACTICE	ANURADHA MA'AM

NDA 1 2025 LIVE CLASSES

11:30AM	GK - ANCIENT & MEDIEVAL HISTORY - MCQ CLASS	RUBY MA'AM
4:00PM	MATHS - PERMUTATION & COMBINATION - CLASS 2	NAVJYOTI SIR
5:30PM	ENGLISH - ORDERING OF SENTENCES - CLASS 2	ANURADHA MA'AM

CDS 1 2025 LIVE CLASSES

11:30AM	GK - ANCIENT & MEDIEVAL HISTORY - MCQ CLASS	RUBY MA'AM
5:30PM	ENGLISH - ORDERING OF SENTENCES - CLASS 2	ANURADHA MA'AM
7:00PM	MATHS - GEOMETRY - CLASS 3	NAVJYOTI SIR

AFCAT 1 2025 LIVE CLASSES

5:30PM	ENGLISH - ORDERING OF SENTENCES - CLASS 2	ANURADHA MA'AM
7:00PM	MATHS - GEOMETRY - CLASS 3	NAVJYOTI SIR

SSBCrack EXAMS

NUMBER OF PERMUTATIONS UNDER CERTAIN CONDITIONS

The number of permutation of n different things taken all together when r particular things are to be place at some r given places $= {}^{n-r}P_{n-r} = (n-r)!$

} r objects fixed at r places

The number of permutations of n different things taken r at a time when m particular things are to be placed at m given places $= {}^{n-m}P_{r-m}$.

NUMBER OF PERMUTATIONS UNDER CERTAIN CONDITIONS

Number of permutations of n different things, taken r at a time, when a particular things is to be always included in each arrangement, is $r.\ {}^{n-1}P_{r-1}$

Number of permutation of n different things, taken r at a time, when m particular thing is never taken in each arrangement is ${}^{n-m}P_r$.

NUMBER OF PERMUTATIONS UNDER CERTAIN CONDITIONS

Number of permutations of n different things, taken all at a time, when m specified things always come together is $m! \times (n-m+1)!$

Number of permutations of n different things, taken all at a time, when m specified things never come together is $\underbrace{n!}_{\text{Total}} - \underbrace{m! \times (n-m+1)!}_{\text{together}}$

COMBINATIONS

A combination is a selection of some or all of a number of different objects where the order of selection is immaterial.

a b c — 3 objects

selecting 2 out of 3 objects

a b

b c

c a

3 combinations

COMBINATIONS

$$^{n}C_{r} = \frac{n!}{(n-r)!\; r!}$$

$$0 \leq r \leq n$$

$$^{6}C_{2} = \frac{6!}{(6-2)!\; 2!} = \frac{6 \times 5}{2!}$$

SSBCrack EXAMS

IMPORTANT RESULTS

$^nC_n = 1, {}^nC_0 = 1$;

$^4C_4 = 1$ $\quad$ $^4C_0 = 1$

$$^nC_r = \frac{^nP_r}{r!},\ 0 < r \le n.$$

$$^nC_r = \frac{n!}{(n-r)!\,r!} = \frac{^nP_r}{r!}$$

IMPORTANT RESULTS

$^nC_r = {^nC_{n-r}}, (1 < r < n)$ and $^nC_r = \frac{n}{r}\,{^{n-1}C_{r-1}}$

$^{18}C_{14} = \frac{18!}{(18-14)!\,14!} = \frac{18 \times 17 \times 16 \times 15}{4!} = {^{18}C_4}$

$^{13}C_{11} = {^{13}C_2}$

$11 + 2 = 13$

If $^nC_r = {^nC_{r'}}$, then either $r = r'$ or $r + r' = n$

$r' = n - r$

* $^nC_1 = n = {^nC_{n-1}}$

$${}^{n}C_{r} = \left(\frac{n}{r}\right) {}^{n-1}C_{r-1}$$

$${}^{7}C_{4} = {}^{7}C_{3} = \frac{7 \times 6 \times 5}{3!} = 35$$

-1 $\quad$ -1 $\quad$ -1

$${}^{6}C_{3} = \frac{6 \times 5 \times 4}{3!} = (20) \longrightarrow \cancel{20}^{5} \times \frac{7}{\cancel{4}} = 35$$

SSBCrack EXAMS

IMPORTANT RESULTS

$$^{n}C_{r} + ^{n}C_{r-1} = ^{n+1}C_{r}$$

$$^{4}C_{3} + ^{4}C_{2} = ^{4}C_{1} + ^{4}C_{2} = 4 + \frac{4 \times 3}{2!} = 4 + 6 = 10$$

(r) $(r-1)$

$$^{n+1}C_{r} = ^{4+1}C_{3} = ^{5}C_{3} = ^{5}C_{2} = \frac{5 \times 4}{2} = 10$$

QUESTION

PYQ – (2024 – II)

In how many ways can a student choose $(n-2)$ courses out of n courses if 2 courses are compulsory $(n > 4)$?

(a) $(n-3)(n-4)$

(b) $(n-1)(n-2)$

(c) $(n-3)(n-4)/2$

(d) $(n-2)(n-3)/2$ ✓

If 2 courses are compulsory,

$$^{(n-2)}C_{n-4} = {}^{n-2}C_2 = \frac{(n-2)(n-2-1)}{2!}$$

$n-4+2 = n-2$

$$= \frac{(n-2)(n-3)}{2}$$

USING PERMUTATIONS AND COMBINATIONS

Use permutations if a problem calls for the number of arrangements of objects and different orders are to be counted.

Use combinations if a problem calls for the number of ways of selecting objects and the order of selection is not to be counted.

EXAMPLE

A student has to answer 10 questions, choosing atleast 4 from each of Parts A and B.

If there are 6 questions in Part A and 7 in Part B, in how many ways can the student choose 10 questions?

Part A — Part B

$^6C_4$ —— $^7C_6$

$^6C_5$ —— $^7C_5$

$^6C_6$ —— $^7C_4$

$$\underline{^6C_4 \times {}^7C_6} + \underline{^6C_5 \times {}^7C_5} + \underline{^6C_6 \times {}^7C_4}$$

$$^6C_2 \times {}^7C_1 + {}^6C_1 \times {}^7C_2 + 1 \times {}^7C_3$$

$$= \frac{6\times5}{2} \times 7 + 6 \times \frac{7\times6}{2} + 1 \times \frac{7\times6\times5}{3\times2}$$

$$= 15\times7 + 6\times21 + 35 = 105 + 126 + 35$$

$$\begin{array}{r} 105 \\ 126 \\ 35 \\ \hline 266 \\ \hline \end{array}$$

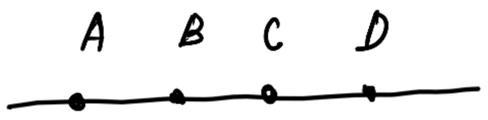
Ans. $\longrightarrow$ 266 ways to choose 10 questions.

POINTS AND NUMBER OF FIGURES

If there are n points in a plane of which m ($< n$) are collinear, then

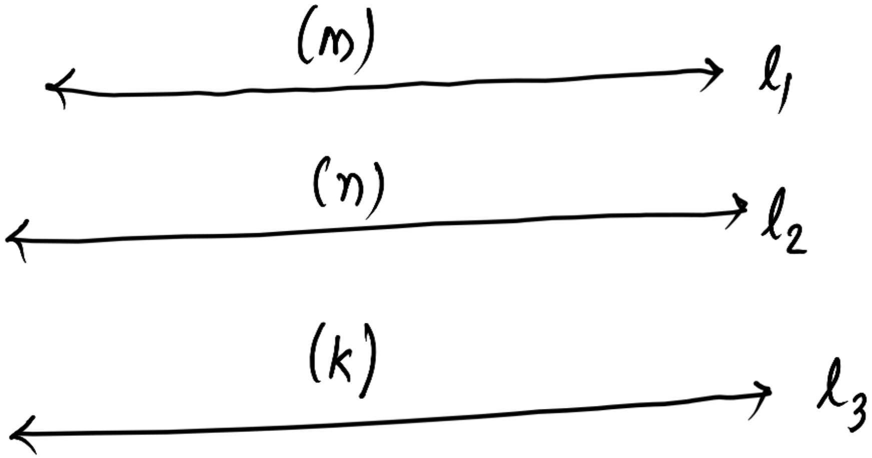
(a) Total number of different straight lines obtain by joining these n points is ${}^nC_2 - {}^mC_2 + 1$

(b) Total number of different triangles formed by joining these n points is ${}^nC_3 - {}^mC_3$



on single line (collinear points)

The straight lines l_1, l_2 and l_3 are parallel and lie in the same plane. A total numbers of m points are taken on l_1; n points on l_2, k points on l_3. The maximum number of triangles formed with vertices at these points are



$$^{m+n+k}C_3 - \left({}^{m}C_3 + {}^{n}C_3 + {}^{k}C_3\right)$$

$$^{m+n+k}C_3 - {}^{m}C_3 - {}^{n}C_3 - {}^{k}C_3$$

SSBCrack EXAMS

POINTS AND NUMBER OF FIGURES

Number of diagonals in polygon of n sides is

$${}^{n}C_{2} - n$$

$$\frac{n(n-1)}{2!} - n = \frac{n^2 - n - 2n}{2} = \frac{n^2 - 3n}{2}$$

$$\frac{n(n-3)}{2}$$

POINTS AND NUMBER OF FIGURES

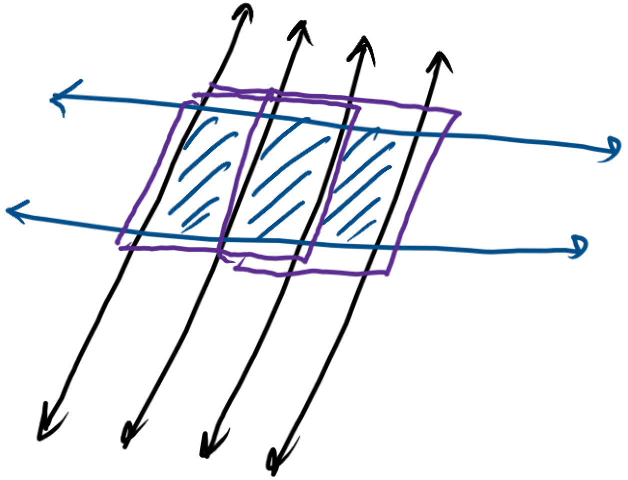
If m parallel lines in a plane are intersected by a family of other n parallel lines. Then total number of parallelograms so formed is ${}^mC_2 \times {}^nC_2$ *i.e*

$$\frac{m(m-1)}{2!} \times \frac{n(n-1)}{2!}$$

$$\frac{mn(m-1)(n-1)}{4}$$

~~Eg~~

4 and 2 parallel lines,



6 parallelograms

POINTS AND NUMBER OF FIGURES

Given n points on the circumference of a circle, then

(i) Number of straight lines = ${}^nC_2$

(ii) Number of triangles = ${}^nC_3$

(iii) Number of quadrilaterals = ${}^nC_4$

QUESTION

PYQ – (2024 – I)

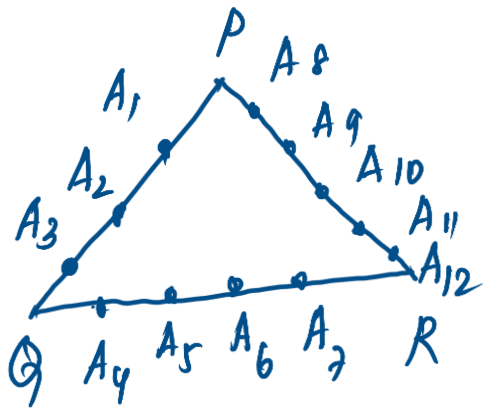
A triangle PQR is such that 3 points lie on the side PQ, 4 points on QR and 5 points on RP respectively. Triangles are constructed using these points as vertices. What is the number of triangles so formed ?

(a) 205

(b) 206

(c) 215

(d) 220



$$^{3+4+5}C_3 - {}^{3}C_3 - {}^{4}C_3 - {}^{5}C_3$$

$$^{12}C_3 - 1 - 4 - 10$$

$$= \frac{\cancel{12}^{\,2} \times 11 \times 10}{3 \times \cancel{2}} - 15 = 220 - 15 = 205$$

QUESTION

In how many ways can the letters of the word INDIA be permutated such that in each combination, vowels should occupy odd positions?

PYQ – (2024 – I)

(a) 3

(b) 6

(c) 9

(d) 12

I N D I A

I N I D A

$$\frac{3!}{2!} \times 2! = 3! = 6$$

QUESTION

PYQ – (2024 – II)

The letters of the word EQUATION are arranged in such a way that all vowels as well as consonants are together. How many such arrangements are there?

(a) 240

(b) 720

(c) 1440

(d) 1620

E Q U A T I O N

AEIOU QTN } 2 objects

$2! \times 5! \times 3!$

$= 2 \times 120 \times 6 = 1440$

SSBCrack EXAMS

QUESTION

What is the sum of all four digit numbers formed by using all digits 0, 1, 4, 5 without repetition of digits ?

(a) 44440

(b) 46460

(c) 46440

(d) 64440

PYQ – (2024 – II)

3 3 2 1 = 18

1 0 4 5

1 0 5 4

1 4 0 5

1 4 5 0

1 5 0 4

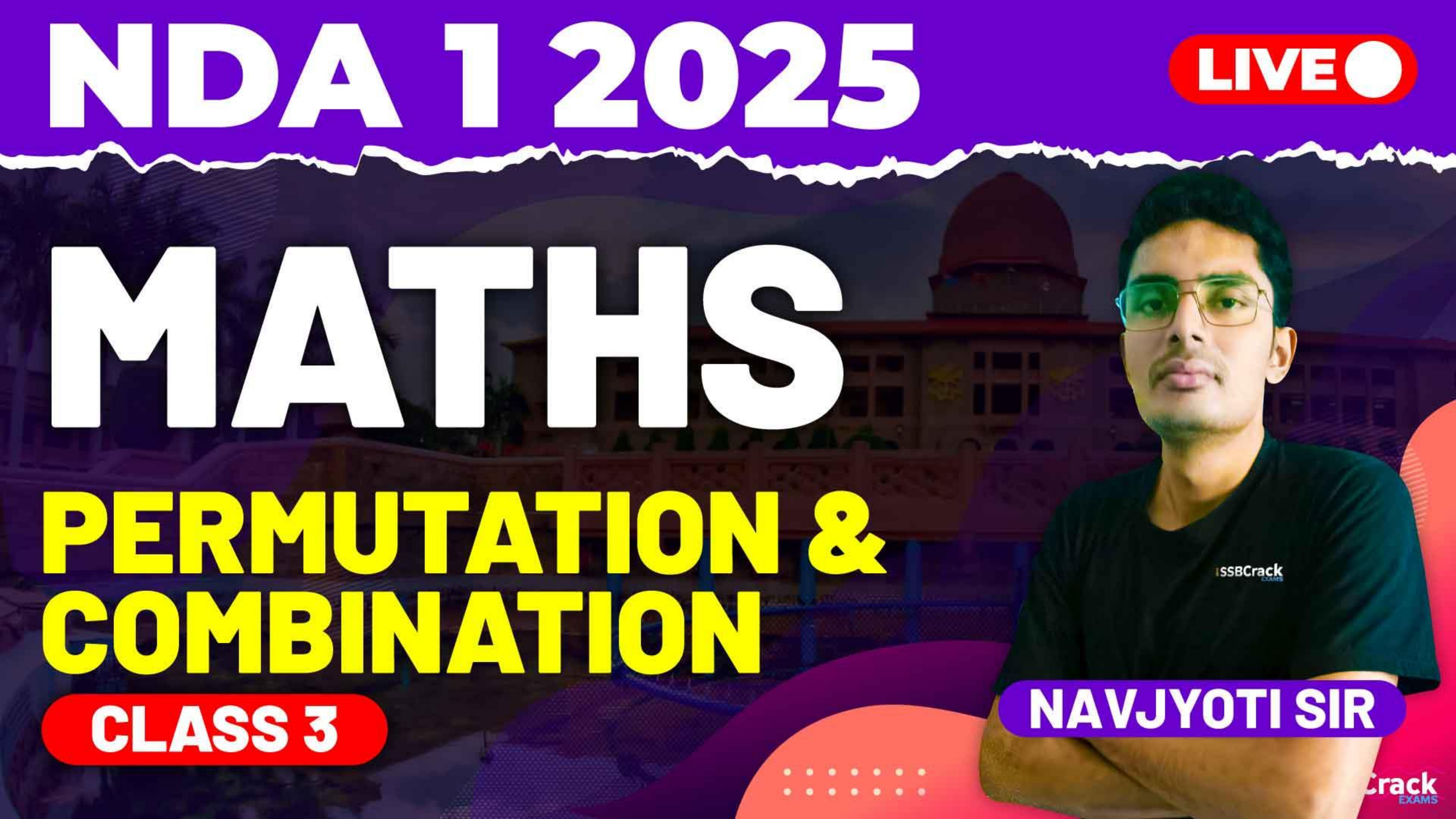
1 5 4 0

$$\underbrace{(6 \times 1000 + 6 \times 4000 + 6 \times 5000)}$$

6000 + 24000 + 30000

= 60000

adding the thousand places for all 18 numbers.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