Lesson - 1

Introduction

Same

Permutation Combination - Probability

1-2
2-1
2-3
3-2
1-3
3-1

① ② ③

1-2
2-3
3-1

formula

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

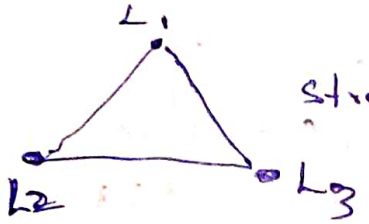
$$4C_2 = \frac{4 \times 3}{1 \times 2} = 6$$

① ② ③

$$3C_2 = \frac{3 \times 2}{1 \times 2}$$

$$15C_{11} = 15C_4 = \frac{15 \times 14 \times 13 \times 12}{1 \times 2 \times 3 \times 4}$$

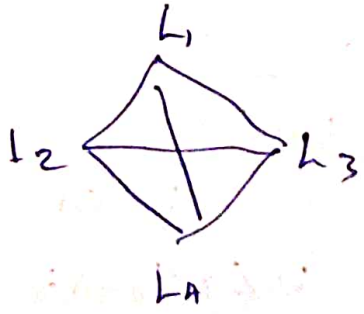
Triangle
Circle



Straight line

$$3C_2 = \frac{3 \times 2}{1 \times 2} = 3$$

triangle



$$4C_3 = \frac{4 \times 3 \times 2}{1 \times 2 \times 3} = 4$$

Lesson-2

Basic Questions

$6! = 1\times2\times3\times4\times5\times6$

$3! = 1\times2\times3$

$n! =$

$(n-5)! = (n-5)(n-6)(n-7)(n-8)\ldots$

$^{14}C_2 = C(14,2)$

① If $C(n,7) = C(n,5)$, find n

Shortcut method

$nC_7 = nC_5$ equal ⇒

$x + y = n$ $\quad 7+5 = 12$

$n = 12$

2) If $C(n,8) = n(n,6)$, find $C(n,2) = ?$

$nC_8 = nC_6$

$x + y = n$ $\quad 8+6 = 14$

$n = 14$

$C(n,2) = ?$

$^{14}C_2 = \frac{14\times13}{1\times2} = 91$

3) If $^{18}C_r = {}^{18}C_{r+2}$, find $rC_5 = ?$

$x + y = n$ $\quad r + r + 2 = 18$

$2r + 2 = 18$

$2r = 16$

$r = 8$

$rC_5 = ?$

$8C_5 = ?$

$\frac{8\times7\times6\times5\times4}{1\times2\times3\times4\times5} = 56$

4) If $^{2n}C_r = {}^{2n}C_{r+2}$, find r

$x + y = n$

$r + r + 2 = 2n$

$2r + 2 = 2n$

$r + 1 = n$

$r = n - 1$

(5) Find $\sum_{r=1}^{5} C(5,r) = ?$ 11:05

and → ×
or → +

$C(5,1)$ or $C(5,2)$ or $C(5,3)$ or $C(5,4)$ or $C(5,5)$

$5C_1 + 5C_2 + 5C_3 + 5C_4 + 5C_5$

$5 + \frac{5 \times 4^2}{1 \times 2_1} + \frac{5 \times 4^2 \times 3}{1 \times 2 \times 3} + 5 + 1$

$= 5 + 10 + 10 + 5 + 1$

$\Rightarrow$ 31

Lesson-3 Based on Committee

and → ×
or → +

Total nC_r ⇒ (14)(2) Selection

(1) Different Committees are to be made as per the requirement given in each question.
In how many different ways can it be done?
5 students out of which 5 are doctors and 3 are scientist

(1) A Committee of 4 in which 3 are doctor and 1 is scientist?

Consist of (4) — 5 Doctor, 3 Scientist

i) 3 Doctor and 1 Scientist

$5C_3 \times 3C_1$

$\Rightarrow \frac{5 \times 4^2 \times 3}{1 \times 2_1 \times 3} \times 3$ (3 × 1 × 2 × 3 / 1 × 2)

$\Rightarrow$ 30 ways

(2) A Committee of 5 in which 3 are doctors

ii) 3 doctor and a scientist

$5C_3 \times 3C_2$

$\frac{5 \times 4^2 \times 3}{1 \times 2 \times 3} \times 3$ $\Rightarrow$ 30 ways

3) A Committee of 2 in which there is no Doctors?

ii) 2 Scientist

$3C_2 = 3$ ways

4) A Committee of 3 in which there is no Scientist?

$$5C_3 = \frac{5 \times 4 \times 3}{1 \times 2 \times 3}$$

$= 10$ ways

5) A Committee of 2 in which either both are Doctors or both are Scientist

either Doctor or Scientist

(or) → addition

$5C_2$ (or) $3C_2$

$$\frac{5 \times 4^2}{1 \times 2_1} + \frac{3 \times 2}{1 \times 2}$$

$= 13$

6) A Committee of 3 in which at least 1 doctors are there?

D-1 or D-2 or D-3

$(5C_1 \times 3C_2) + (5C_2 \times 3C_1) + 5C_3$

$$5 \times 3 + \left(\frac{5 \times 4^2}{1 \times 2} \times 3\right) \times \frac{5 \times 4^2 \times 3}{1 \times 2_1 \times 3}$$

$15 + 30 + 10$

$= 55$ ways

SET-2

A Committee of 5 members is to be formed out of 3 Trainers, 4 Professors and 6 Research associates. In how many different ways can this be done.

① The Committee should have all 4 professors and 1 research associate or all 3 trainers and 2 professors?

3 Trainer 4 Prof 6 RA

:) (4 Prof 1 RA) or (3 Train and + 2 Prof)

$(^4C_4 \times {}^6C_1) + ({}^3C_3 \times {}^4C_2)$

$(1 \times 6) + (1 \times 6)$

$= 12$

② The Committee should have 2 trainers and 3 RA

$^6C_3$ and $^3C_2$

x

③ The Committee should have 2 trainers

$^3C_2 \times {}^{10}C_3$

= answer

4) The Committee should not contain any Professors

$^9C_5 \rightarrow \frac{9 \times 8 \times 7 \times 6 \times 5}{1 \times 2 \times 3 \times 4 \times 5}$

$= 9 \times 14$

$= 126$

Set-3

10 men and 8 women out of which 5 men are teachers, 3 men are doctors and 2 are Scientist. Among women 3 are Teachers, 2 are Doctors, 2 researchers and 1 Lawyer

① A Committee of 5 in which 3 men and 2 women are there.

$$10C_3 \times 8C_2 = \frac{10 \times 9 \times 8}{1 \times 2 \times 3} \times \frac{8 \times 7}{1 \times 2}$$

$$= 120 \times 28$$

$$\Rightarrow 3360 \text{ ways}$$

② A Committee of 4 in which at least 2 women are there.

$$(8C_2 \times 10C_2) \text{ or } (8C_3 \times 10C_1) \text{ (or) } 8C_4$$
$$+ \qquad\qquad + \qquad\qquad +$$

③ A Committee of 2 ?

$$18C_2 = \frac{18 \times 17}{1 \times 2} = 153 \text{ ways.}$$

4) A Committee of 3 in which there is not a teacher and no doctor.

2 men 3 women

$$5C_3$$
$$= \frac{5 \times 4 \times 3}{1 \times 2 \times 3}$$
$$= 10$$

Lesson-4

(1) in how many ways can 5 Cricketers be selected from a group of 10?

formula $^{n}C_{r}$ - $^{10}C_{5}$ = $\frac{10 \times 9 \times 8 \times 7 \times 6}{1 \times 2 \times 3 \times 4 \times 5}$ = 36 × 7 = 252 ways.

2) A Question Paper has 2 parts, Part A and Part B each containing 10 questions. if the Studet has to choose 8 from Part-A and 5 from Part-B in how many ways can he choose the question.

$^{10}C_{8} \times {}^{10}C_{5}$

$\Rightarrow {}^{10}C_{2} \times {}^{10}C_{5}$

3) find the number of ways of selecting 9 balls from 6 red balls 5 white balls and 5 blue balls, if each ~~questio~~ selection consists of 3 balls of each colour

.... 6 red, 5 white, 5 Blue

$^{6}C_{3} \times {}^{5}C_{3} \times {}^{5}C_{3}$

$\Rightarrow$

Included / excluded

(1) In how many ways can a Cricket team of 11 players be selected out of 16 players, if a particular player are always to be included.

16 player 11 player

14 player 9 player

$\Rightarrow {}^{14}C_{9}$

$^{14}C_{5}$ = answer

② in how many ways can a Cricket team of 11 players be Selected out of 16 players of 1 particular player is to be excluded

16 player 11 player

15 player 11 player

$15C_{11} = 15C_4$ ⟹

3) 2 Particular players are to be included and 1 particular player is excluded

16 p 11 p

14 player 9 player

13 player 9 player

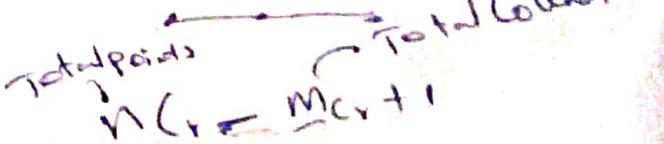
$13C_9 \Rightarrow 3C_4 =$

Lesson-5
Collinear & non-Collinear

non-Collinear Points

$nC_r = 3C_2$

Collinear Points



$nC_r = {}^{m}C_{r+1}$

$3C_2 - 3C_{2+1}$

① In a plane, there are 16 non-collinear points. find the number of straight lines formed?

first formula. $nC_r = {}^{8}16C_2 = \frac{16 \times 15}{1 \times 2} = 120$

② There are 14 points in a plane out of which 4 points are collinear. find the number of straight line formed.

$nC_r - mC_1 + 1$

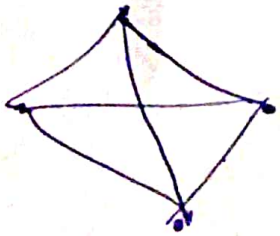
$14C_2 - 4C_2 + 1$

$\frac{14 \times 13}{1 \times 2} - \frac{4 \times 3}{1 \times 2} + 1$

$91 - 6 + 1$

$= 86$ straight line.

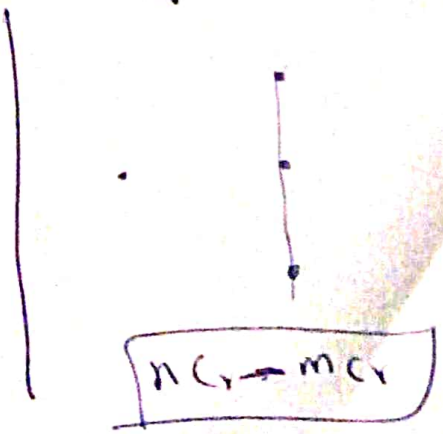
triangle



nC_r

$4C_3$

$= 4$



$nC_r - mC_r$

$4C_2 - 3C_r$

3) There are 14 points in a plane out of which 4 points are collinear. find the number of Triangles formed.

$$^{n}C_{r} - {}^{m}C_{r}$$

$$^{14}C_{3} - {}^{4}C_{3}$$

$$\frac{14 \times 13 \times \cancel{12}^{2}}{1 \times \cancel{2} \times \cancel{3}} - 4$$

$$\Rightarrow 14 \times 26$$

$$= 364 - 4$$

$$= 360$$