

## Combination

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

with formula

$$4 C_2 = \frac{4 \times 3}{1 \times 2} \xrightarrow{\text{2 times reduce}} \text{red only 4 to 2}$$

$$14 C_3 = \frac{14 \times 13 \times 12}{1 \times 2 \times 3} \xrightarrow{\text{3 times reduce}} \text{write}$$

3 ball of combination selection

$$3 C_2 = \frac{3 \times 2}{1 \times 2} = 3 \xrightarrow{\text{2 times reduce}}$$

$$5 C_3 = \frac{5 \times 4 \times 3}{1 \times 2 \times 3} = 10 \quad \text{or} \quad \begin{array}{r} 6 \\ 5 \\ 4 \\ 3 \\ 2 \\ 1 \\ \hline 120 \end{array}$$

If big number is given

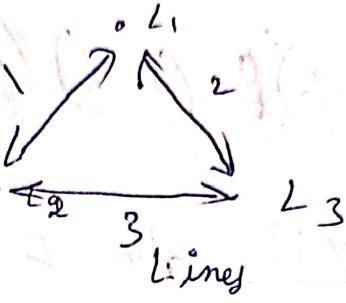
$$15 C_{11} = \frac{15 \times 14 \times 13 \times 12}{1 \times 2 \times 3 \times 4} = 455 \quad 15 C_{11} = C_4$$

$$15 - 11 = 4 \quad 15 C_{11} \text{ is eq to } 15 C_4$$

$$15 C_4 = \frac{15!}{4!(15-4)!}$$

$$15 C_4$$

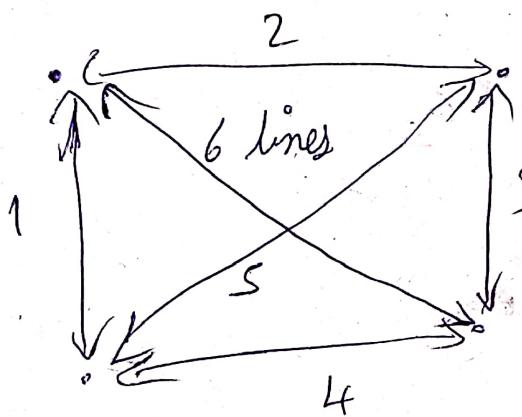
(Q) Total 3 dots  $L_1, L_2, L_3$ . How many straight line can draw



Well a straightline can draw by 2 points

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

4 Points  $L_1, L_2, L_3, L_4$

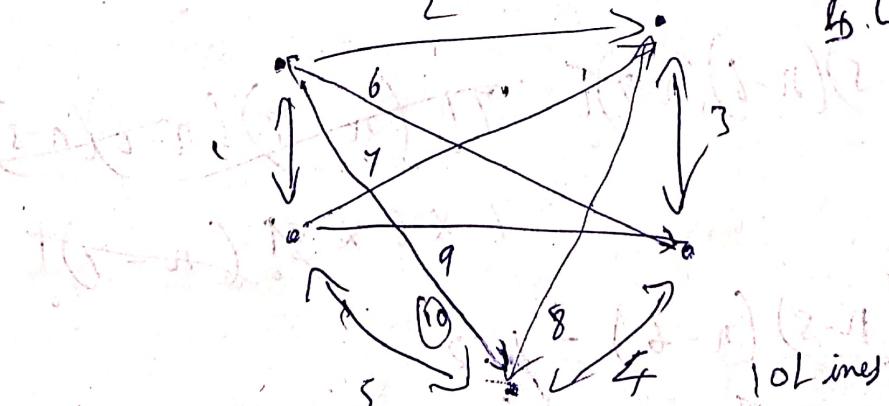


$$4 C_2 = \frac{4 \times 3}{1 \times 2} = 6$$

5 Points

$L_1, L_2, L_3, L_4, L_5$

$$5 C_2 = \frac{5 \times 4}{1 \times 2} = 10$$



Lesson 2 Permutation & Combination Basic Question

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

$${}^{14}C_2 = \frac{14 \times 13}{1 \times 2} \text{ also } = C(14, 2)$$

$$C(14, 2) = \boxed{x+y=n}$$

and  $\rightarrow x$   
or  $-y$

Q) If  $C(n, 7) = C(n, 5)$  find  $n$

$$C(n, 7)$$

$${}^nC_7 = {}^nC_5$$

$$\frac{n!}{7!(n-8)!}$$

$$\frac{n!}{7!(n-7)!} = \frac{n!}{5!(n-5)!}$$

$$5!(n-5)! = 7!(n-7)!$$

~~$$5!(n-5)(n-6)(n-7) = 7!(n-7)(n-6)(n-5)$$~~

~~$$= 7 \times 6 \times 5!(n-7)!$$~~

~~$$(n-5)(n-6) = 4 \cdot 2$$~~

$$n^2 - 6n - 5n + 30 = 42$$

$$n^2 - 11n - 12 = 0 \quad -12 \leq \frac{-19}{1} \\ -11$$

$$(n-12)(n+1) = 0$$

$$\boxed{n=12}$$

$$\boxed{n=-1}$$

negative X

$$\checkmark n=12$$

Short cut

$$nC_2 = nC_y$$



$$\boxed{x+y=n}$$

$$\boxed{7+5=12}$$

$$\textcircled{2} \quad \text{If } C(n, 8) = C(n, 6) \quad \text{find } C(n, 2)$$

$$x+y=n$$

$$\boxed{8+6=14}$$

$$n=14$$

$$14C_2 = \frac{14 \times 13}{1 \times 2} = 91$$

$$\textcircled{3} \quad \text{If } 18C_r = 18C_{r+2} \quad \text{find } rC_5 = ?$$

$$x+y=n \quad r=6$$

$$r+r+2=18$$

$$r=8$$

$${}^8C_5 = {}^8C_3 \quad 8-5=3$$

$${}^8C_3 = \frac{8 \times 7 \times 6}{1 \times 2 \times 3} = 56$$

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

$$x + y = n$$

$$r + r+2 = 2n$$

$$2r + 2 = 2n$$

$$(r+1) = n$$

$$r = n - 1$$

5) Find  $\sum_{r=1}^5 C(s, r) = ?$  and  $\rightarrow x$   
 or  $\rightarrow +$

$\sum C(s, 1) + C(s, 2) + C(s, 3) + C(s, 4) + C(s, 5)$

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

$$5 + 10 + 10 + 5$$

Lesson: 3

Total 3  
at least 1 doctor  
 $(C_1 \times C_2) + (C_2 \times C_1) + C_3$

Also Based on committee

OK -

and

$\rightarrow x$

OR  $\rightarrow f$ .

d and s

either or s -

$C_3 + 1$

only d -  $C_{2s}$

only s -  $C_{2d}$

- 1) Different committees are to be made as per the requirement given in each question. In how many different ways can it be done? 8 students out of which 5 are doctor & 3 are scientist

A committee of 4 in which 3 are doctors & 1 is scientist?

~~Method~~  
need 5 D & 3 Sc

need

i) 3 doctors and 1 scientist.

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

ii) 5 in which 3 are doctor

$$\text{Total } S = 3 + 2 \quad \text{Total doctor } 5 \\ \text{and} \quad \text{Sci } 3$$

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

iii) A committee of 2 in which there is no Doctor?

Total 5 doctor 3 Scientist

$$1 \times 3 = 3$$

iv) A committee of 3 in which there is no Scientist?

Total 5 doctor 3 Scientist

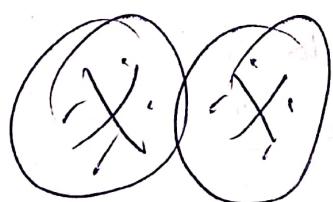
$$5 \times 4 = \frac{5 \times 4}{1 \times 2} = 10$$

v) A committee of 2 in which either both are Doctors or both are Scientists

$$\frac{5 \times 4}{2} = 10$$

(X)

vi) A committee of 3 in which at least 1 doctor are there?



At least 1 among  $\rightarrow$  1 Doctor

3 in 1 doctor or 2 doctors or 3 doctors

$$\textcircled{X} \quad (S_{C_1} \times {}^3C_2) + (S_{C_2} \times {}^3C_1) + (S_{C_3} \times {}^3C_0)$$

$$1d \times 2s + 2d \times 1s + 3d \times 0s$$

$$5 \times 3 + 10 \times 3 + 10 = 55$$

Lesson 3 <sup>(4)</sup>: Based on Committee

SET - 2+3

A committee <sup>Total</sup> 5 members is to be formed out of  
3 Trainees, 4 Professors & 6 Research associates

In how many different ways can this be done.

- i) The committee should have all 4 professors &  
research associate or all 3 trainees & 2 professor

$$\text{Re} \quad \text{Total } S \quad \text{research} \quad \text{train.} \quad \text{Pro} \quad \frac{2}{4 \times 3} = 6 \\ ({}^4C_4 \times {}^6C_1) + ({}^3C_3 \times {}^4C_2)$$

$$1 \times 6 + 1 \times 6 = 12$$

$$25 + 100 = 125$$

(ii) The committee should have 2 trainees & 3 research associates

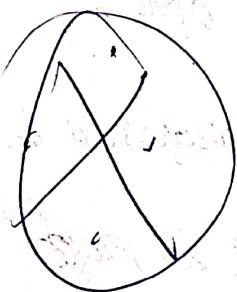
$$3C_2 \times C_3$$

$$3 \times \frac{6 \times 5}{1 \times 2 \times 1} = 30$$

$$= 60$$

iii) The committee should have 2 trainees?

~~2 trainees and 3 res + 2 trainee and 3 res~~



$$3C_2 \times (C_3 + C_4)$$

$$3 \cdot (20 + 4)$$

$$3(24) = 72$$

3 Train and 4 Prof 6 R.A

③ 2 from other, so 4 + 6

$$S = 3 \times C_2 \times 10C_3$$

$$= 3 \times \frac{10 \times 9 \times 8}{1 \times 2 \times 1} = 360$$

iv) The Committee should not contain only professors?

$$\text{Total } S = 3 \text{ Train} \quad 4 \cancel{\text{Prof}} \quad 6 \cancel{8} A$$

$$3 + 6 = 9$$

(X)

5 from the 9 members

$${}^9 C_5 = \frac{9 \times 8 \times 7 \times 6}{4 \times 3 \times 2 \times 1} = 126$$

sets Different Committees are to be made as per the requirement given in each question. In how many different ways can it be done?

10 men & 8 women out of which 5 men are

teachers, 3 men are doctors & 2 are scientists.

Among women, 3 are teachers, 2 are Doctor, 2 are

I don -

i) A committee of 5 in which 3 men & 2 women

$$\begin{array}{c} 5 \\ \times \\ 3 \\ \times \\ 10 \times 9 \times 8 \\ \hline 1 \times 2 \times 3 \end{array} \quad \begin{array}{c} 8 \times 7 \times 6 \\ \times \\ 5 \times 4 \times 3 \\ \hline 1 \times 2 \end{array} \quad 0 \quad 56 \quad 120 \times 56 = 672$$

$$\begin{array}{c} 7 \\ \times \\ 5 \\ \times \\ 1 \times 2 \\ \hline 6 \end{array}$$