S-1

(3) (8) ____ IO $5_{C_2}$ 4!

HSTRY

(5) __ __ 1, 3, 5, 7, 9

$5_{C_2}$ 2!

(13) 2-W let n-men

$n_{C_2} \cdot 2 = 66 + {}^{n}C_1 \, {}^{2}C_1 \cdot 2$

2 men played 2 games

$\frac{n(n-1)}{2} \cdot 2 = 66 + n \cdot 2 \cdot 2$

$n^2 - 5n - 66 = 0$

$n = 11$

11 M
2 W
= 13
Ans

(15) A B C $A^1$ $B^1$ $C^1$ — 10 others

$AA^1$ $BB^1$ $CC^1$

$^2C_1$ $^2C_1$ $^2C_1$ $^{10}C_3$

(17)

| 4 AP | 5 PC | 6 BT |
|---|---|---|
| 1 | 1 | 1 |
| 1 | 1 | 2 |
| 1 | 2 | 1 |
| 2 | 1 | 1 |
| 2 | 2 | 2 |

0-1

(3) 1 2 3 4 5 6 7

2 2 2 2 2

$^{7}C_{2}$ $2^{5}$

2 places for 2, 2

(5) _ _ _ _ [5]

8 × 8 × 7 × 6

+

_ _ (5) _ _ = 0

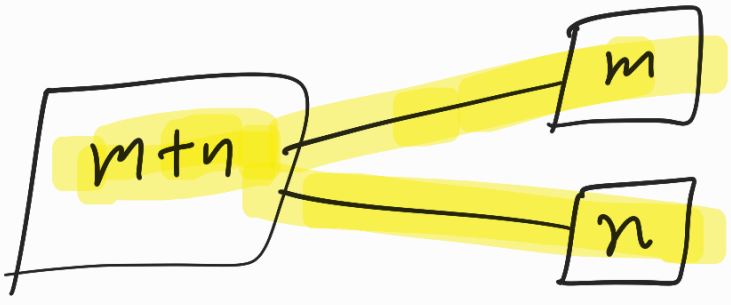
$^{4}C_{1}$ 8 × 7 × 6

~~0~~ 1
2 3
4 ~~5~~
6 7
8 9

H.W. = 01 → 10 to 26

# Formation of groups

① Total no. of different things $= (m+n)$




2 groups

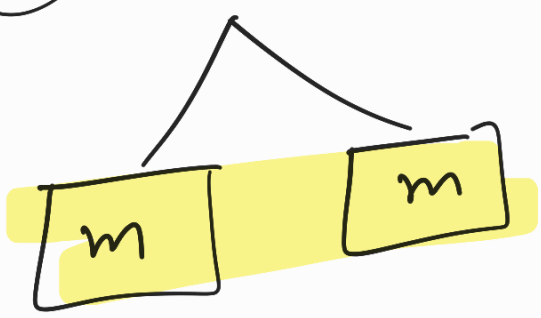
$$\text{no. of groups} = \frac{(m+n)!}{m!\,n!}$$

Ex:- 100 → 10, 20, 30, 40 } 4 groups

$$\frac{100!}{10!\ 20!\ 30!\ 40!}$$

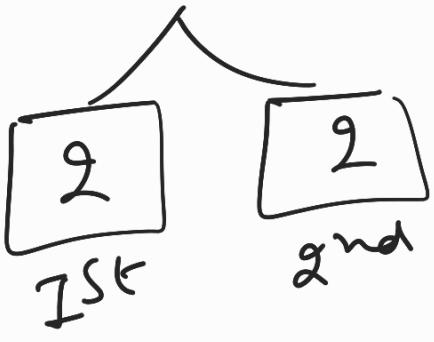
$$= {}^{100}C_{10}\ {}^{90}C_{20}\ {}^{70}C_{30}$$

(II) $2m$ = Total no of diff$^{nt}$ things




Total no. of ways = $\frac{2m!}{m!\,m!\,2!}$

ABCD → 4 things




AB CD

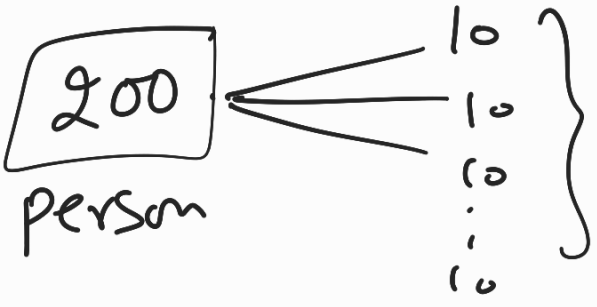
AC BD

AD BC

$\frac{4!}{2!\,2!\,2!} = 3$

↑ no. of groups in which things are equal

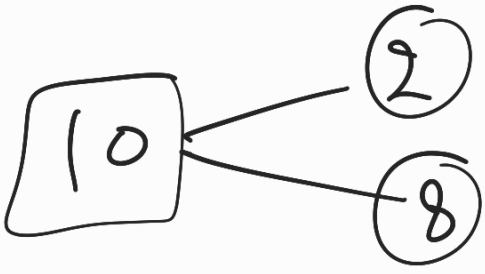
Ex:-



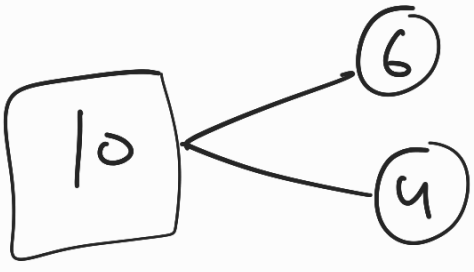

20 groups

$$\frac{200!}{\underbrace{10!\ 10!\ \cdots\ \cdots\ 10!}_{20 \text{ times}}\ 20!}$$

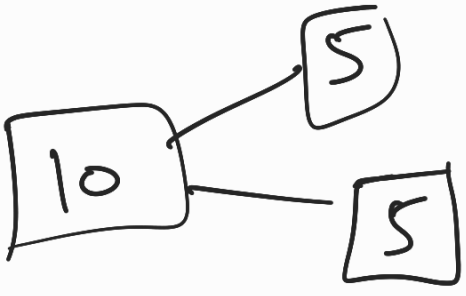
Ex:



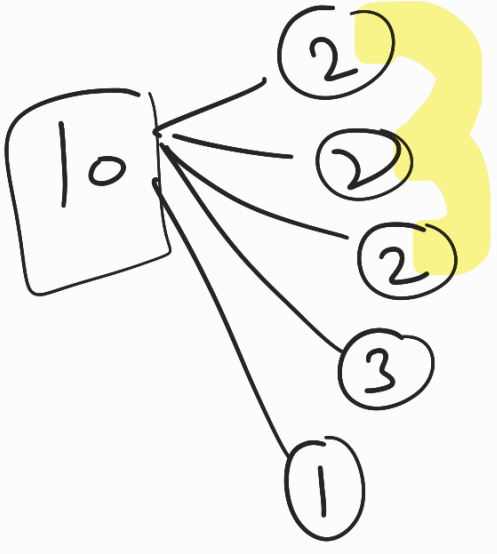

$$\equiv \frac{10!}{2!\ 8!}$$




$$\equiv \frac{10!}{6!\ 4!}$$




$$\equiv \frac{10!}{5!\ 5!\ 2!}$$




$$\equiv \frac{10!}{2!\ 2!\ 2!\ 3!\ 1!\ 3!}$$

Ex:- 5 diff$^{nt}$ things distribute in 3 students If each gets atleast one thing

Soln

| I$^{st}$ | 2$^{nd}$ | 3$^{rd}$ | groups |
|---|---|---|---|
| 1 | 1 | 3 | ← case I |
| OR 1 | 2 | 2 | ← case II |

$$\text{case (I)} = \frac{5!}{1!\,1!\,3!\,2!}$$

$$\text{case (II)} = \frac{5!}{1!\,2!\,2!\,2!}$$

} no. of ways of group

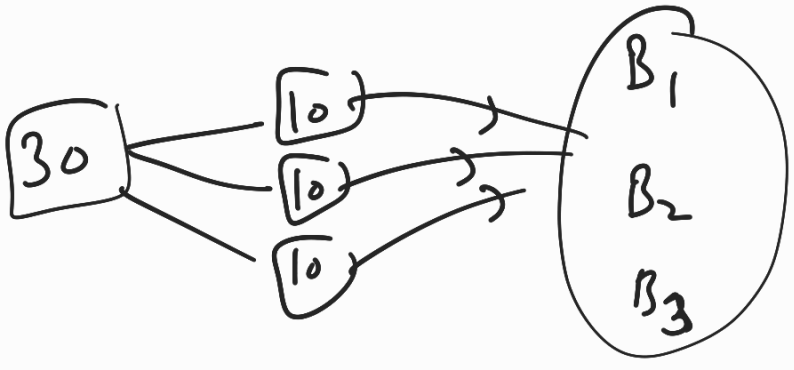
$$\text{Ans} = \frac{5!}{1!\,1!\,3!\,2!}3! + \frac{5!}{1!\,2!\,2!\,2!}3!$$

Ex:- find no. of ways in which 30 men can be divided in to 3 equal groups ?

$$\frac{30!}{10!\ 10!\ 10!\ 3!}$$

Ex:- In how many ways 30 jawans can be deputed equally on 3 borders??

$$\frac{30!}{10!\ 10!\ 10!\ 3!} \times 3!$$




Ex:- 8 computers (different) are distributed into 5 schools if each gets atleast one computer.

| | I | II | III | IV | V | |
|---|---|---|---|---|---|---|
| ① | 1 | 1 | 1 | 1 | 4 | ← |
| ② | 1 | 1 | 1 | 2 | 3 | ← |
| ③ | 1 | 1 | 2 | 2 | 2 | ← |

Distribution = 5!

Ex:- 6 different balls are distributed in to 3 children if each gets atleast one.

| | I | II | III | ⇐ groups | Distribute ↓ |
|---|---|---|---|---|---|
| ① | 1 | 1 | 4 | → $\frac{6!}{1!1!4!2!}$ | 3! |
| ② | 1 | 2 | 3 | → $\frac{6!}{1!2!3!}$ | 3! |
| ③ | 2 | 2 | 2 | → $\frac{6!}{2!2!2!3!}$ | 3! |

Ans = 540

Ex:- 5 diff$^{nt}$ books

Distributed in to 3 students

if each gets atleast one ⟹ 150 Ans

Wrong method

Students → A B C | Books = PCMHE

$$^5C_3 \cdot 3! \cdot 3 \cdot 3 = 540 \times$$

(I)

| A | B | C |
|---|---|---|
| P | C | M |
| H | E | |

PCMHE

(II)

| A | D | C |
|---|---|---|
| H | E | M |
| P | | C |

Repeat

# PCMHE ← Books

A B C ← Students

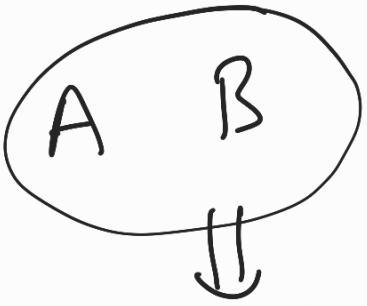
Total = $3^5$ (No condition)

Total − when Exactly two get nothing

− when Exactly one get nothing

Exactly two get nothing = 3

Exactly one get nothing = $3(2^5-2)$


$2^5 - 2$

⇓ Total

⇓ when all books are given to A or B

Ans: $3^5 - 3 - 3(2^5 - 2)$

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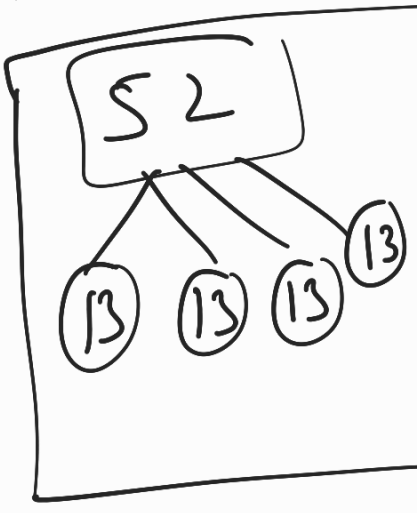
Ex:- In how ways 52 cards can be distributed among 4 players if each get equal no. of cards

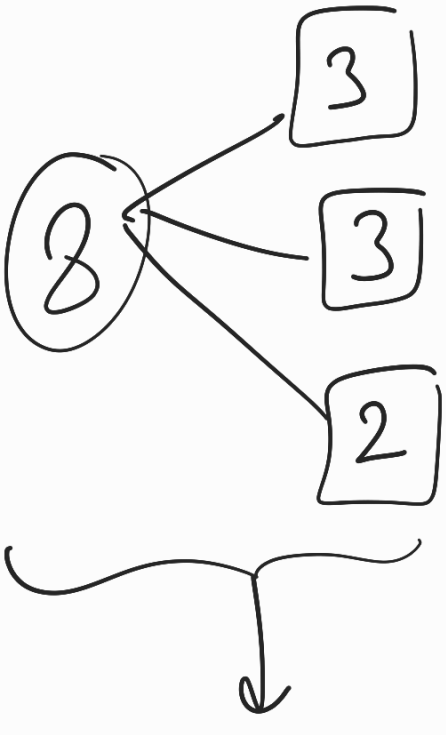
$$\left( \frac{52!}{(13!)^4 \, 4!} \right) 4!$$

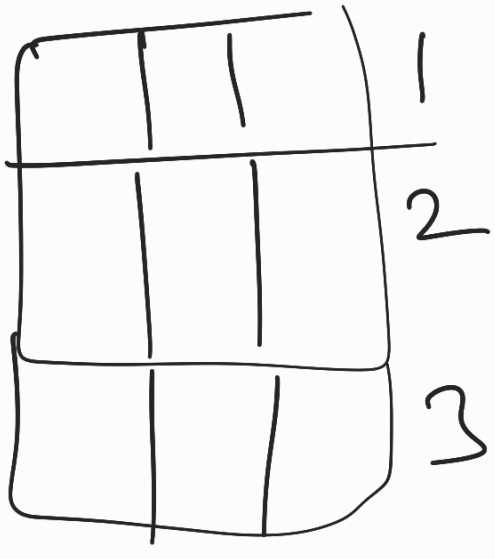



Ex:- number of ways in which 8 persons can be

Seated in 3 diff$^{nt}$ taxis having 3 seats

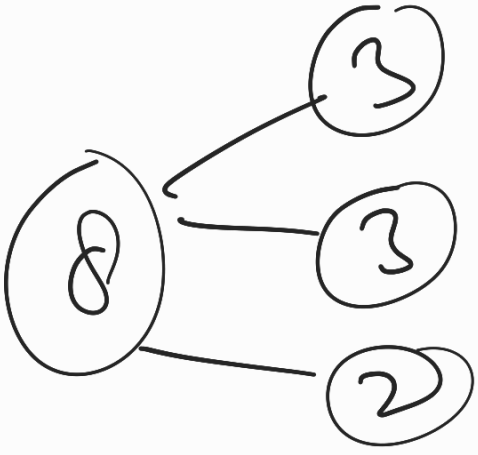
Q① If Internal arrangement of persons inside taxi is immaterial.

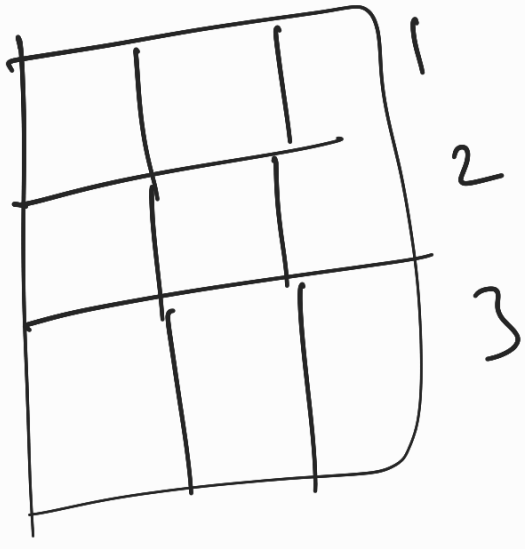



$$\frac{8!}{3!\,3!\,2!\,2!} \times 3! \quad \text{Ans.}$$

Q(2) If internal arrangement is also matter




$$\frac{8!}{3!\,3!\,2!\,2!} \times 3! \times (3!\,3!\,{}^{3}C_{2}\,2!)$$

3, 3, 2 arrangements

# Permutations of Alike objects

Total no of things $= n$

$p$ things are alike of $1^{st}$ kind

$q$ —— " —— $2^{nd}$ kind

$r$ —— " —— $3^{rd}$ kind

rest are diff$^{nt}$

$$n \geq p+q+r$$

Total permutation $= \dfrac{n!}{p!\,q!\,r!}$

Ex:-

A B C
A C B
B A C
B C A
C A B
C B A

} 3!

$$\left.\begin{matrix} ABA \\ AAB \\ BAA \end{matrix}\right\}_3 = \frac{3!}{2!}$$

$$AAA = 1 = \frac{3!}{3!}$$

EX:- DADDY $= \frac{5!}{3!} = 20$

3D, A, Y

MAHABHARAT $= \frac{10!}{4!\,2!}$

2H, 4A

COMMITTEE $= \frac{9!}{2!\,2!\,2!}$

C, O, 2M, 2T, 2E, I

Ex:- 21W, 19B Balls are arranged in line. (ball of same colour are alike). Find no. of arrangements if all black are separated.

$|W_1|W_2|W_3|---|W_{21}|$

22 gaps

$$1. \; {}^{22}C_{19} \cdot 1 = \underline{\text{Ans}}$$

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$$21W, 19B = \frac{40!}{21!\,19!} = \text{Total permutation (No condition)}$$