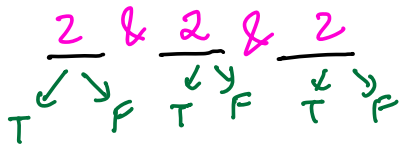
Q1 ⇒ Give 3 T/F ques
In how many ways we can ans them



$2 * 2 * 2 = 8$

T T T	F T T
T T F	F T F
T F T	F F T
T F F	F F F

Q2 ⇒ If there are 10 girls & 7 boys in a hall. Count the # of ways to pick one Boy girl pair

G_1	B_1
G_2	B_2
G_3	B_3
⋮	⋮
G_{10}	B_7

(G_1, B_1) (G_1, B_2) (G_1, B_3) (G_1, B_4) (G_1, B_5), (G_1, B_6), (G_1, B_7)
(G_2, B_1) — — — — — — — — (G_2, B_7)

$[G_3$

$[G_1$

$\vdots$

G_{10}

$7 * 10 = 70$ pairs

Q3 ⇒

Count total number of paths from Hyd to Delhi

$3 * 4 = 12$

Q ⇒

$2 * 3 = 6$

Q ⇒

Hyd → Mum → Delhi OR Hyd → Nagpur → D

3 * 4 + 2 * 6

12 + 6 = 18

Q⇒ U can gift one of following combo

3 * 5 ← 1 pen & 1 book

7 * 3 ← 1 flower & 1 choclate

3 ← 1 Ring

39

Pen : 3

Book : 5

Flower : 7

Chocolate : 3

Ring : 3

Permutation

(Arrangement of objects)

o o o o

(i, j) ≠ (j, i)

Q⇒ Count no. of ways to arrange 3 character a, b, c

3 * 2 * 1 = 6

a _ _

a b c

⇒ 3!

a b c

a b c

a c b

a a b ✗

c c c ✗

a b c

a c b
b a c
b c a
c a b
c b a

Q⇒ Count number of ways to arrange 4 diff char a, b, c & d.

$4 * 3 * 2 * 1 = 24 = 4!$

No. of ways to arrange n distinct object in n places

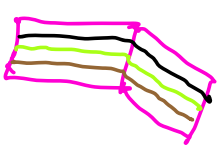
$N * (N-1) * (N-2) * \cdots * 1$

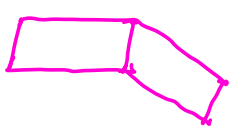
⇒ $N!$

Q⇒ No of ways to arrange 0 object

$0! = 1$

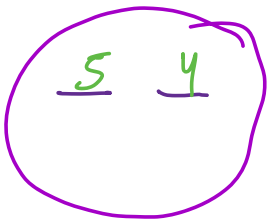
3 → 100 Rs note





3!

Q⇒ Given 5 diff char, in how many ways can we arrange them in 2 place



5 * 4 = 20

5 * 4 * 3 ⇒ 60

N distinct obj & 3 position → N * (N-1) * (N-2)

—— & 4 —— ⇒ N * (N-1) * (N-2) * (N-3)

—— & K —— ⇒ N * (N-1) * ---- * (N-K+1)

N * (N-1) * ... * (N-K+1) = N * (N-1) * ... * (N-K+1) * (N-K) * (N-K-1) * * ... * 1

(N-K) * (N-K-1) * * ... * 1

N distinct obj & K position = $\frac{N!}{(N-K)!}$ = ${}^{n}P_{K}$

Combination

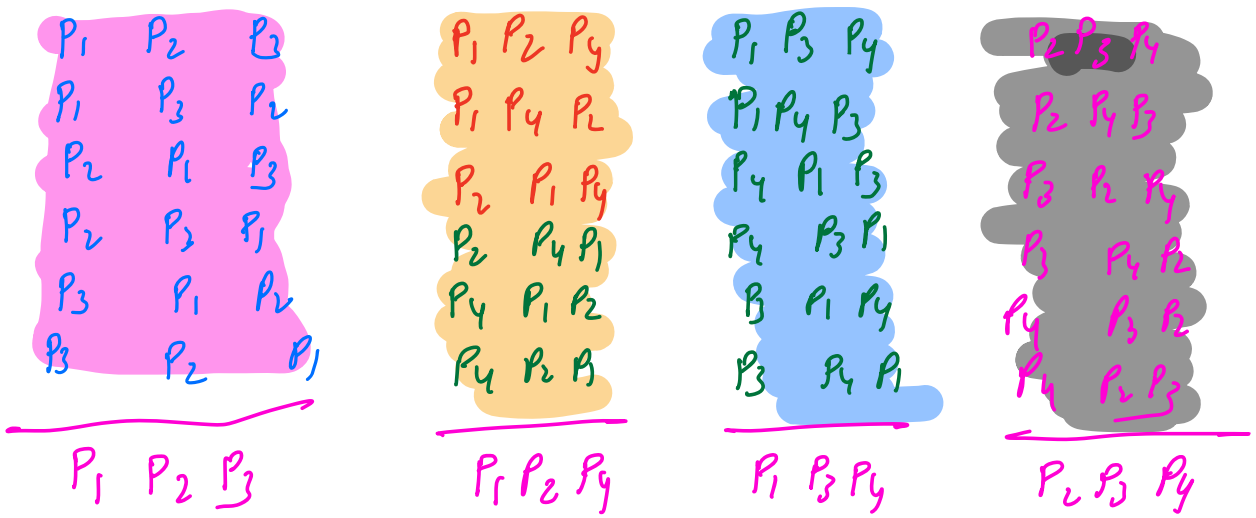
(selection of objects

(i, j) = = (j, i)

⇒ Dhoni, Kholi, Rohit, Bumrah, Shami
B, S, K, R, D

Q⇒ 3 batsman from 4 cricketers

D K R B
P_1 P_2 P_3 P_4



Total arrangement = 24

selection = $\frac{24}{3!}$ = 4

Ways to arrange N object in r places

$^nP_r = \frac{N!}{(N-r)!}$

ways to arrange r items in r buckets
= r!

No of ways to select r items from N items ↓

$$\frac{N!}{(N-r)!} * \frac{1}{r!} = {}^{n}C_r$$

$$^{N}C_r = \frac{^{n}P_r}{r!}$$

Break: 10 : 24 PM

Properties

$$^{N}C_1 = \frac{N!}{(N-1)! * 1!} = \frac{N * (N-1)!}{(N-1)!} = N$$

$$^{N}C_0 = \frac{N!}{(N-0)! * 0!} = 1$$

Q⇒

$${}^nC_0 + {}^nC_1 + {}^nC_2 + \cdots + {}^nC_n = 2^n$$

$\{1, 2, 3\}$

$${}^3C_0 = 1 = \{\ \}$$
$${}^3C_1 = 3 = \{1\}, \{2\}, \{3\}$$
$${}^3C_2 = 3 = \{1,2\}, \{1,3\}, \{2,3\}$$
$${}^3C_3 = 1 = \{1, 2, 3\}$$

All possible subsets of $\{1, 2, 3\}$

$\Rightarrow 2^n$

Q⇒ Given 5 players, count no. of ways of selecting 2 players

$${}^5C_2$$

$P_1\ P_2$ $P_3\ P_4\ P_5$
$P_1\ P_3$ $P_2\ P_4\ P_5$
$P_1\ P_4$ $P_2\ P_3\ P_5$
$P_1\ P_5$ $P_2\ P_3\ P_4$

$P_2\ P_3$ $P_1\ P_4\ P_5$
$P_2\ P_4$ $P_1\ P_3\ P_5$
$P_2\ P_5$ $P_1\ P_3\ P_4$

$P_3\ P_4$ $P_1\ P_2\ P_5$
$P_3\ P_5$ $P_1\ P_2\ P_4$
$P_4\ P_5$ $P_1\ P_2\ P_3$

$$^5C_2 = \frac{5!}{3!\,2!} = 10$$

$$^5C_3 = \frac{5!}{2!\,3!} = 10$$

$$^NC_r = {}^nC_{N-r}$$

Given N items → select r from them

$a_1, a_2, a_3, \ldots\ldots, a_N$

^NC_r

Include in selected $^{N-1}C_{r-1}$ OR Exclude from selected $^{N-1}C_r$

$$^NC_r = {}^{N-1}C_{r-1} + {}^{N-1}C_r$$

$$^{N-1}C_r + {}^{N-1}C_{r-1}$$

$$= \frac{(N-1)!}{r!\,(N-1-r)!} + \frac{(N-1)!}{(N-1-r+1)!\,(r-1)!}$$

$$= \frac{(N-1)!}{r! * (N-r-1)!} + \frac{(N-1)!}{(N-r)!\,(r-1)!}$$

$$= \frac{(N-1)!}{r\,(r-1)!\,(N-r-1)!} + \frac{(N-1)!}{(N-r)\,(N-r-1)!\,(r-1)!}$$

$$= \frac{(N-1)!}{(N-r-1)!\,(r-1)!}\left[\frac{1}{r} + \frac{1}{N-r}\right]$$

$$= \frac{(N-1)!}{(N-r-1)!\,(r-1)!}\left[\frac{N \cancel{-r} \cancel{+r}}{(N-r)\,r}\right]$$

$$= \frac{N\,(N-1)!}{(N-r-1)!\,(N-r) * (r-1)! * r}$$

$$= \frac{N!}{(N-r)!\,r!} = {}^{N}C_{r}$$