Addition and Multiplication Rule

Wednesday, 30 April 2025 6:01 AM

Q1> Given 3 T/F questions, every question needs to be answered T/F. How many ways we can answer all questions.

TTT
TTF
⋮
⋮
} 8 ways.

Q2> Given 10 girls 7 boys. How many different ways are possible.

1 G — B_1 10, 10, ⋮, B_7 10

1 B — G_1, ⋮, G_{10}

70

Q3>

3 x 4

Hydrabad to delhi via mumbai!

4 * 1
+ 4 * 1
+ 4 * 1 or 3 x 4

AND ≡ *
OR ≡ +

Addition / Multiplication rule.

Permutation

Permutations :-

Arrangement of objects. Order matters

$(i, j) \neq (j, i)$

Q1 Given 3 distinct characters ?
How many ways we can arrange them ?

S = "abc"
acb
cab
⋮
} 6 ways.

$\underline{3}$ $\underline{2}$ $\underline{1}$

3	2	1
a	b/c	a
b	a/c	b
c	a/b	c

Ex abcd

$4 * 3 * 2 * 1 = 24$

Q Given N distinct elements. How many ways we can arrange them ?

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

$= n!$

Q Given 5 distinct elements, how many ways we can arrang 3 of them ?

$\underline{5}$ $\underline{4}$ $\underline{3}$ = 60

* N distinct characters, arrange r characters.

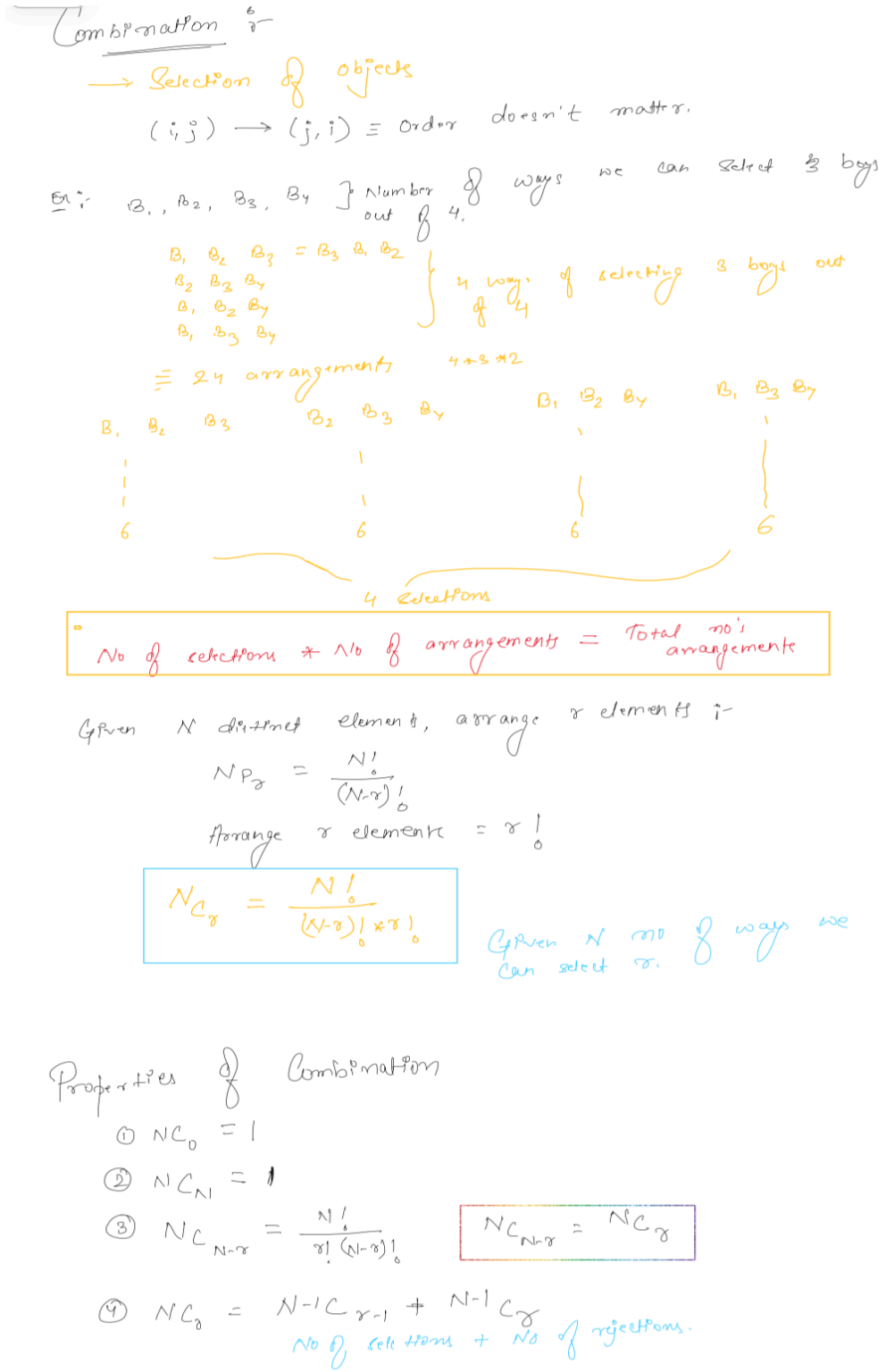
$N * (N-1) * (N-2) * \cdots (N-r+1)$

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

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

→ Permutation of N items taken r at a time.

Combination



Properties of Combination

① $^{N}C_{0} = 1$

② $^{N}C_{N} = 1$

③ $^{N}C_{N-r} = \frac{N!}{r!(N-r)!}$ $\quad$ $^{N}C_{N-r} = {}^{N}C_{r}$

④ $^{N}C_{r} = {}^{N-1}C_{r-1} + {}^{N-1}C_{r}$

No of selections + No of rejections.

Pascal Triangle

Problem 1 :

PASCAL Triangle

Generate pascal's triangle for a given value N.

$[i][j] = {}^{i}C_{j}$

Brute force :- For each and every value, calculate the factorial and print it.

$${}^{i}C_{j} = {}^{i-1}C_{j-1} + {}^{i-1}C_{j}$$

i → i^{th} row

j → j^{th} column

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

edge case :- mat[0][0] = 1

mat[0][0] = 1

mat[i][0] = 1

mat[i][j] = mat[i-1][mat[j-1] + mat[i-1][j]

```
for(i=1; i<N; i++)
    mat[i][0] = 1
    mat[i][i] = 1
    for(j=1; j<i; j++)
        mat[i][j] = mat[i-1][j] + mat[i-1][j-1]
```

T.C : $O(N^2)$

S.C : $O(N^2)$

Finding Nth column title in the excel sheet

Problem 2

Find the N^{th} Column title

A B C D — — — Z AA AB — — — AZ BA BB — — — BZ

CA — — CZ — — — ZA — — — AAA — — —

N = 3 : C

N = 30 : AD

26 Alphabets (A – Z)

N = 3 : C 'A' + 3 = 'D'

N = 1 : A 97 + 3 = 100

N = 50

26 50-1 = 49 23 A X

: 49 % 26 1 - 1 = 0 0

N = 29

28 % 26 = 2 → AC

ans = " "

while (N > 0) {

pos = (N-1) % 26

ans = (pos + 'A') + ans

N = (N-1)/26

}

return ans.