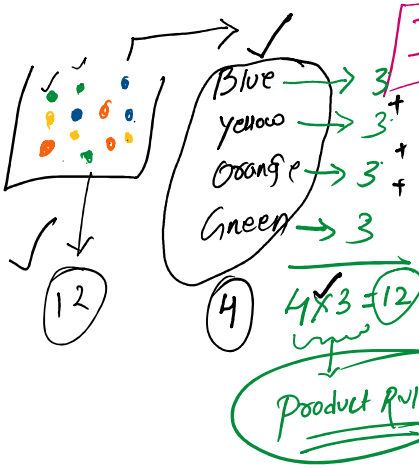
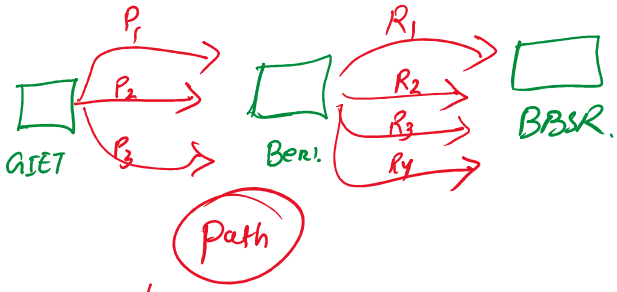
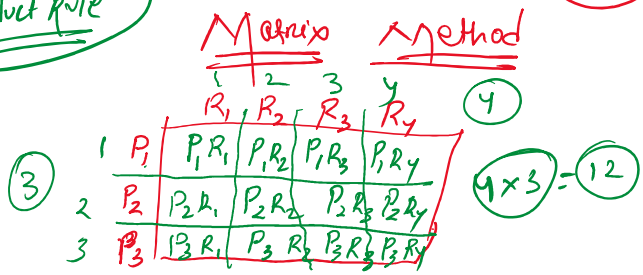
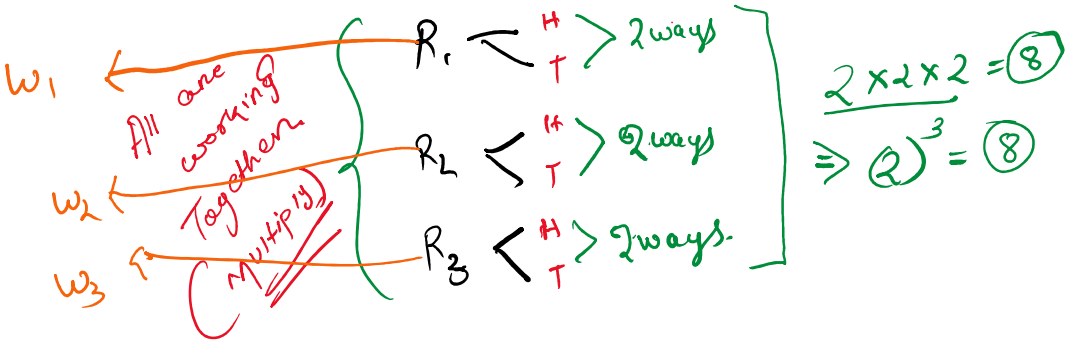
Introduction to Counting







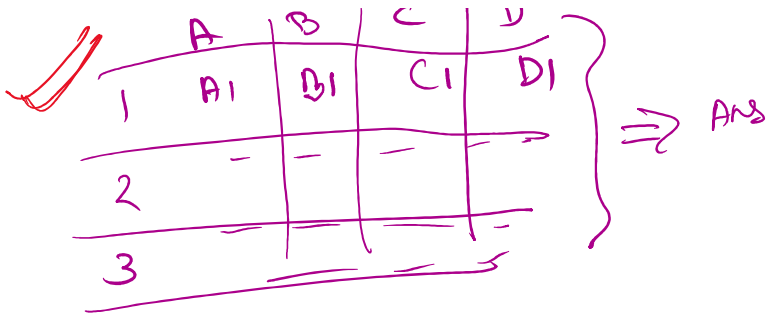
Tossing A three Coins

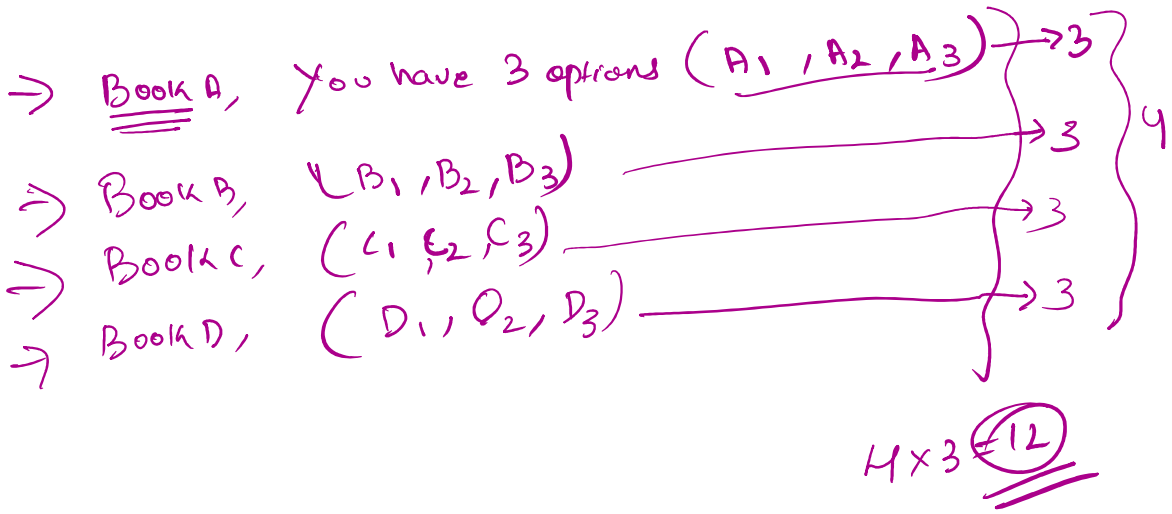


*NOTE - If any work is done Individually ⇒ w_1 or w_2 or w_3
⇒ $w_1 + w_2 + w_3 = 3w$
- If any work is done Simultaneously
⇒ $w_1 \times w_2 \times w_3 = w^3$

Que You have 4 diff. books (A, B, C & D) and 3 diff. Bookmarks (1, 2 & 3). How many ways can you place a bookmark in each book?

Matrix Method





Qᵛᵉ You have 5 diff. flavors of ice cream (Vanilla, Chocolate, Strawberry, mint & cookies & cream) and diff. topping (Sprinkles, whipped cream, and chocolate chips). How many different ice cream Sundaes can you create with one flavour of ice cream and one topping?

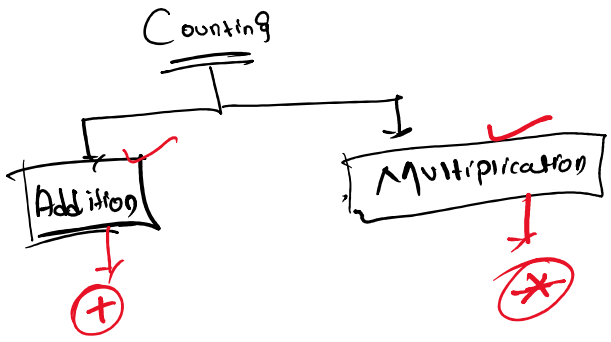
Matrix Method

5 columns

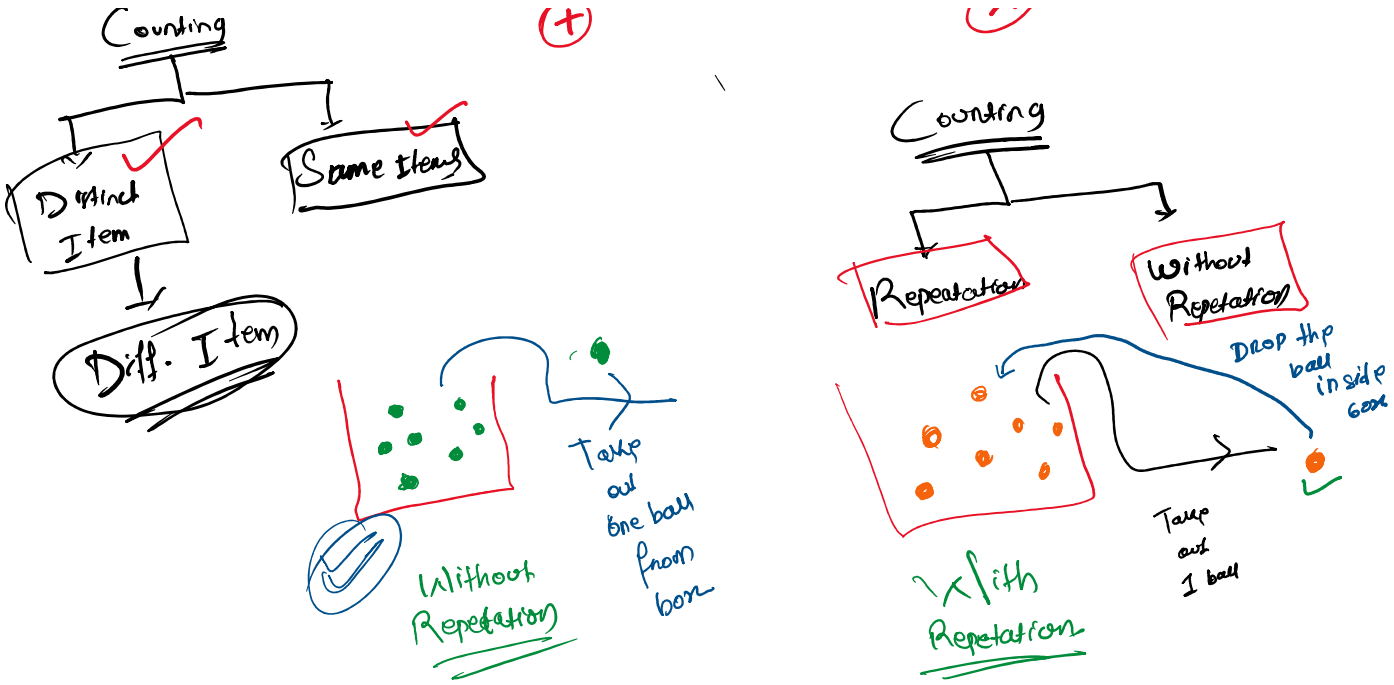
Vanilla · Chocolate · Straw · mint · C & C

3 Rows { Sp, WC, CC

3 × 5 = 15



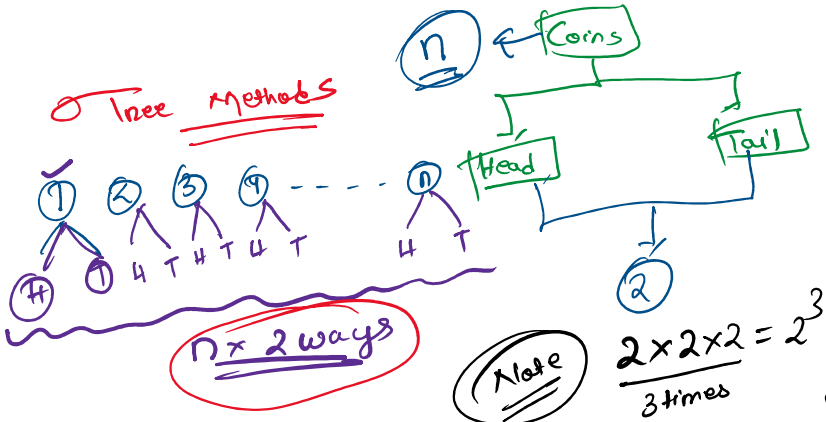
Counting



CASE 1: 'n' different items Taken all at a time (Repetation Allowed)

Experiment with Coins

n - no. of coins.

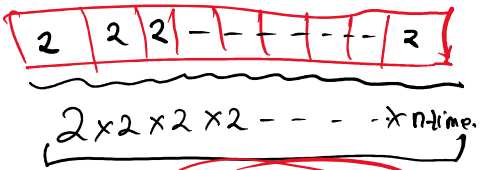


Note

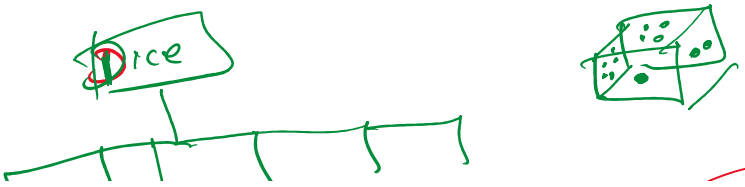
$2 \times 2 \times 2 = 2^3$ (3 times)

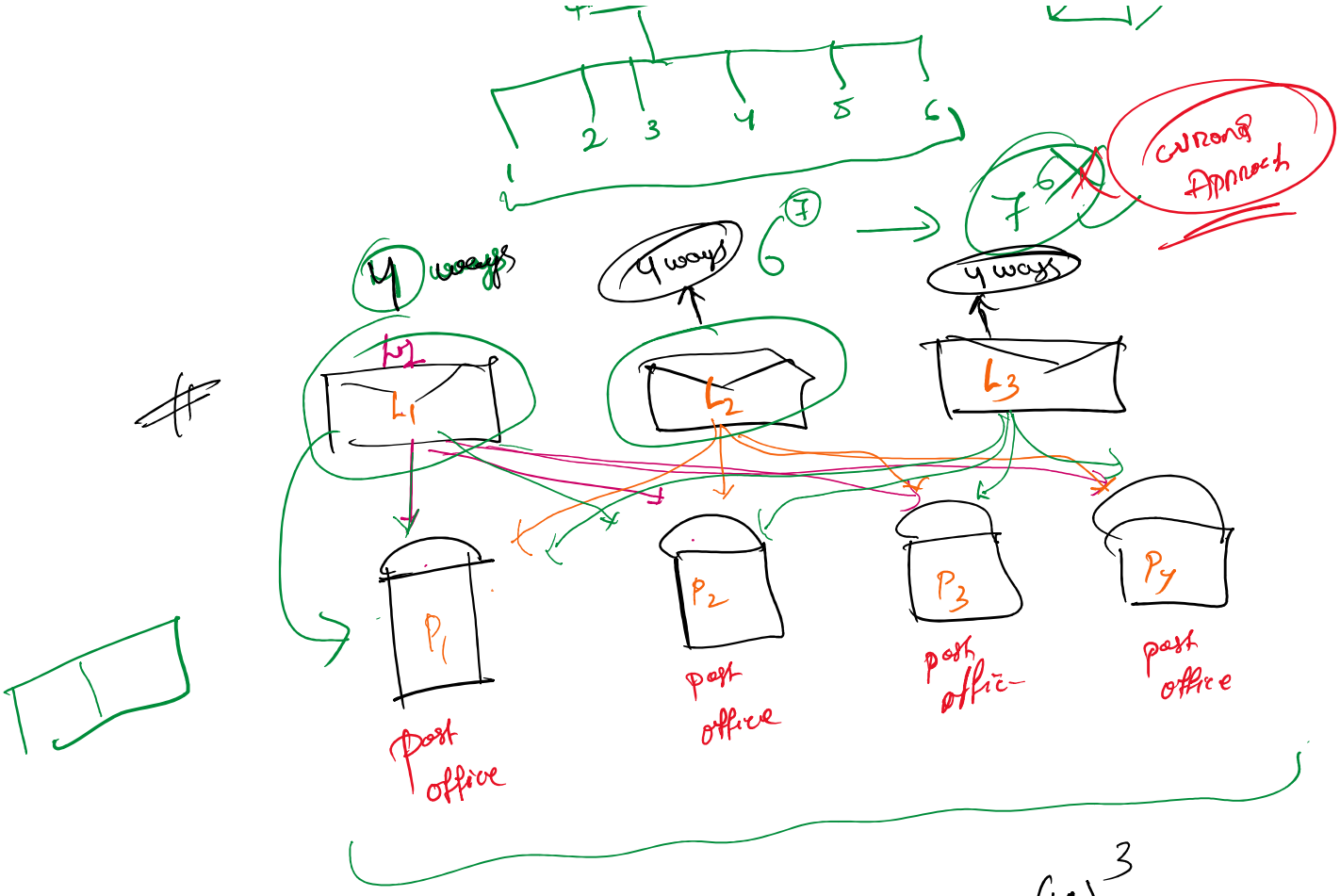
$3 \times 3 \times 3 \times 3 = 3^4$ (4 time)

Box methods



Throwing 7 Dice Simultaneously :-



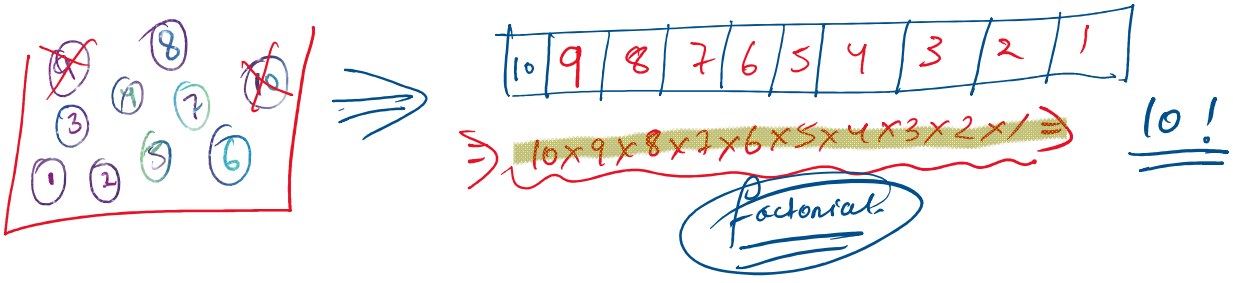


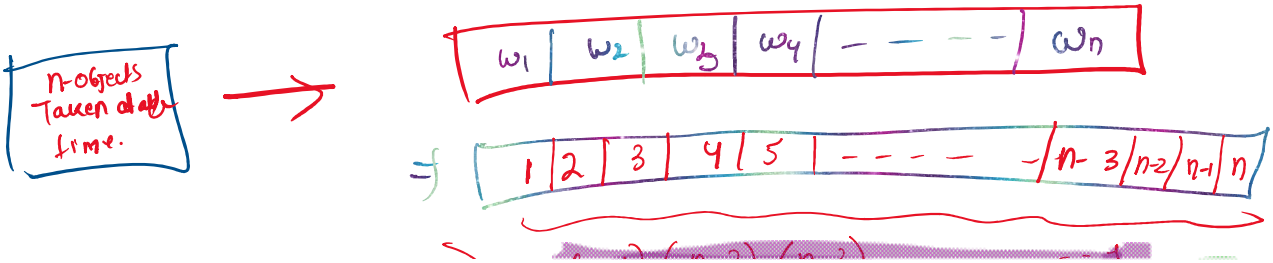
$$4 \times 4 \times 4 = (4)^3$$

$L_1 \quad L_2 \quad L_3$

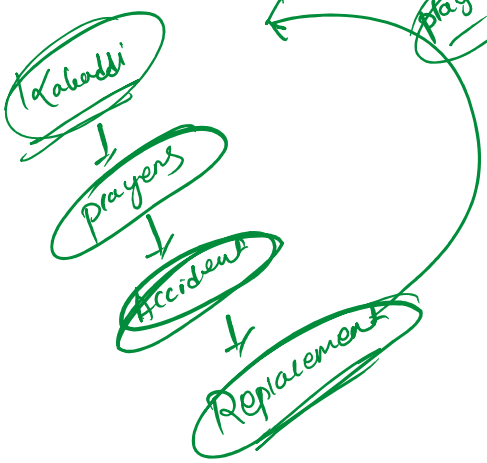
$$\Rightarrow 3 \times 3 \times 3 \times 3 \neq 3^4$$ (wrong Approach)

CASE 2: 'n' different items taken all at a time (Repetation not allowed)



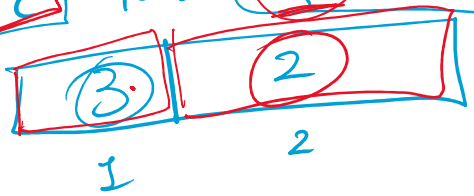


$n(n-1)(n-2)(n-3)\ldots\ldots 1 = n!$



CASE 3 : 'n' different Items taken 'r' at a time (Without Replacement.)

A B C Taken 2 at a time.



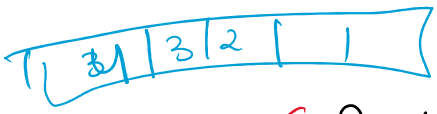
$\Rightarrow 3 \times 2 = 6$

3 way
2 way
1 way

ABC Taken 3 at a time

$= 3 \times 2 \times 1 = 6$

ABCD Taken 4 at a time



$= 4 \times 3 \times 2 \times 1 = 24$

n times taken 'r' at a time (Repetation are not allowed.)

$\Rightarrow n \quad n-1 \quad n-2 \quad n-3 \quad \ldots\ldots \quad n-(r-1)$

$\Rightarrow {}^{n}P_{r} \Rightarrow \frac{\lfloor n}{\lfloor n-r}$

$\Rightarrow$

NOTE: No. of arrangements 'n' diff. Items Taken 'r' at a time.

No. of arrangements = $\frac{\lfloor n}{\lfloor n-r}$

No. of arrangements = x

$x = {}^{n}P_{r} = \frac{\lfloor n}{\lfloor n-r}$

A B C D → 4 ways → 3 ways → 2 ways → 1 way

Taken 3 at a time. Find the no. of arrangement.

$n=4$ $r=3$ ⇒ ${}^{4}P_{3} = \frac{\lfloor 4}{\lfloor 4-3} = 24$

Box Methods

4	3	2

$= 4 \times 3 \times 2 = 24$

Que 1 How many n-digit numbers can be formed using 4, 6, 8, 10, 12 (5 items) without any repetation of digits when:

(i) $n=5$

5	4	3	2	1

120

(A) 120
(B) 15
(C) 5^6
(D) 6^5

(ii) $n=3$

5	4	3

60

(A) 12
(B) 5^3
(C) 60
(D) 3^5

Que How many 3-letter words can be formed using a, b, c, d, e (5 items) if: Repetation is not allowed.

5	4	3

$= 5 \times 4 \times 3$

(A) 60
(B) 5^3
(C) 3^5
(D) 12

(ii) Repetation Allowed 5^3

Que In how many ways can six persons be arranged in a row?

6	5	4	3	2	1
1	2	3	4	5	6

$6 \times 5 \times 4 \times 3 \times 2 \times 1 = 6!$

(A) $6!$
(B) 6^6
(C) 6^5
(D) 5^6

$6 \times 5 \times 4 \times 3 \times 2 \times 1 = 6!$

Que How many 5-digit odd numbers can be formed using digits 0, 1, 2, 3, 4, 5 without repeating digits?

(A) $4 \times 4!$ (B) 288 (C) $5!$ (D) 300