

Permutation & Combinatorics

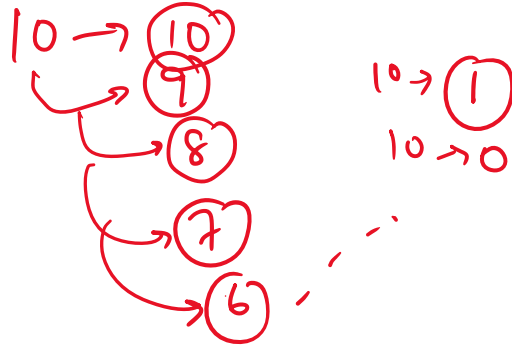


mixed

Birthday → Marriage

10 → 3 weeks

① Future Proof
② Post Analysis



90623
95723

$$10C_{10} + 10C_9 + \dots + 10C_0$$

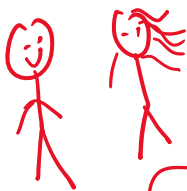
$$= 2^{10}$$

$$10C_{10} + 10C_9 + \dots + 10C_1$$

$$= 2^{10} - 1$$

$$\left(10C_{10} + 10C_9 + \dots + 10C_3 + 10C_2 + 10C_1 \right) + 10C_2 - 10C_1$$

$$= (2^{10} - 1) - 10C_1 - 10C_2$$



10C0 10C2

10C4 10C6 10C8

10C10

$$nC_2 + nC_4 + \dots + nC_n \quad n \geq \text{Even}$$

$$= nC_1 + nC_3 + \dots + nC_{n-1}$$

MSCFE

5 → 12 # Soln of an equation system

a + b + c = 10

a, b, c ∈ ℕ

$$10 + 3 - 1 C_{3-1} \Rightarrow 12C_2$$

a, b, c

$$a + b + c = 4$$

$$4 + 3 - 1 C_{3-1}$$

15/12

1+1
2+0
0+2

~~1/2 + 1/2~~

~~4-1~~

$a+b+c=4$

3+1+0
1+3+0
0+0

$a+b=3$

1+2
2+1
3+0
0+3

$4+3-1 \leq 3-1$

$a+b=2$

$\Rightarrow 6C2 \Rightarrow \frac{6!}{2!4!}$

~~6C2~~
 $\Rightarrow 15$

$2+2-1 \leq 2-1$

$= 3C1 = 3$

$3+2-1 \leq 2-1$

$= 4C1 = \frac{4!}{7!1!} \Rightarrow 4$

10C1
10C2
10C3

$a+b+c+d+e+f+g=6$

$a+b+c+d=8$

- 10C4
- 10C5
- 10C6
- 10C7
- 10C8
- 10C9
- 10C10

S1

S2

S3

S4

S5

S6

$6+7-1 \leq 7-1$

$\Rightarrow 12C6$

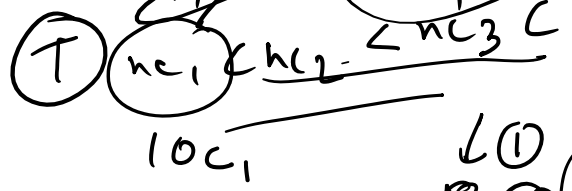
$8+4-1 \leq 4-1$

$= 11C3$

$10C1$
 $\frac{10!}{9!1!}$
 (10)

$10C2$
 $\frac{10!}{2!8!}$
 $\frac{5 \times 9 \times 8!}{2!8!}$
 $\Rightarrow (45)$

CME



Half way time

over due
C n C X



DE - arrangement case

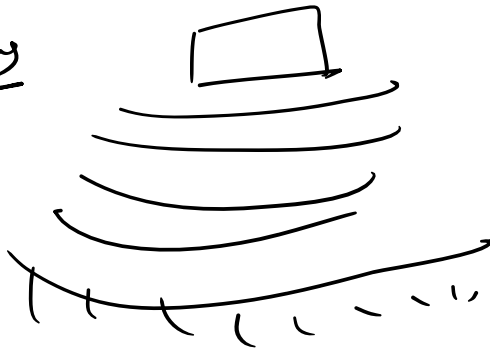
... and ...???

DE - assumption ...
 → Sub Galat / Arr. wrong. Simulations ???

n students

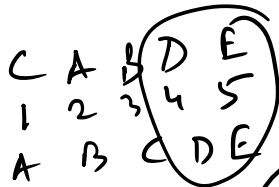
n places

movie hours

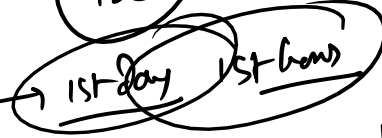


90623
 95123

(5)



50% 2nd hand
 50% Book fair?
 500 → 300
 → 100



(5%)

new chap

fine

2 days

Soln ??

⊕ \$ ↗

⊕ exam

⊕ symptom

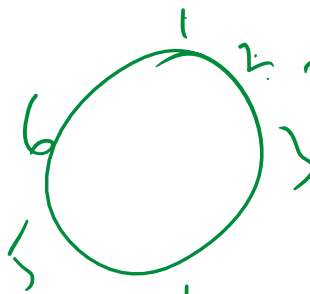
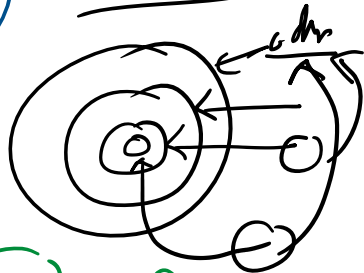
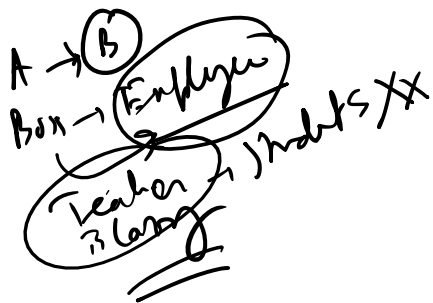


Who trusts ??

Others

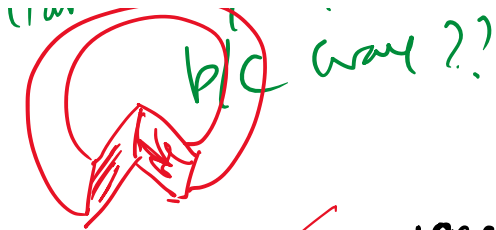


What's at the end



Justice Pandey

How a b/day came
 b/c way ??

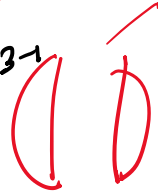
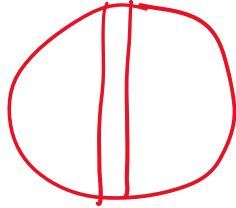


HMD

Polup

$$1000 + 3 - 103 - 1$$

$$\rightarrow 1000 \text{€} \text{€} 2$$



1 to 9
animes
& tmj of
numbers

$$\begin{aligned} K + S + N &= 1000 \\ K + S + N &= 500 \\ K + S + N &= 100 \end{aligned}$$

502€
102€

3
ψ

Exclusion
#

3.157

151 Bsmk
High mde

50 base
25 base

$$\begin{aligned} K + S + N &= 1900,000 \\ K + S + N &= 1,000,000 \\ K + S + N &= 50,000 \end{aligned}$$

2000

1,00000

Hy

1,000

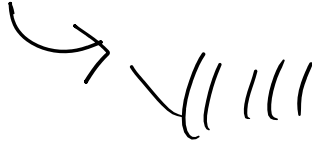
100

UBS

Analysis

UK

22 base

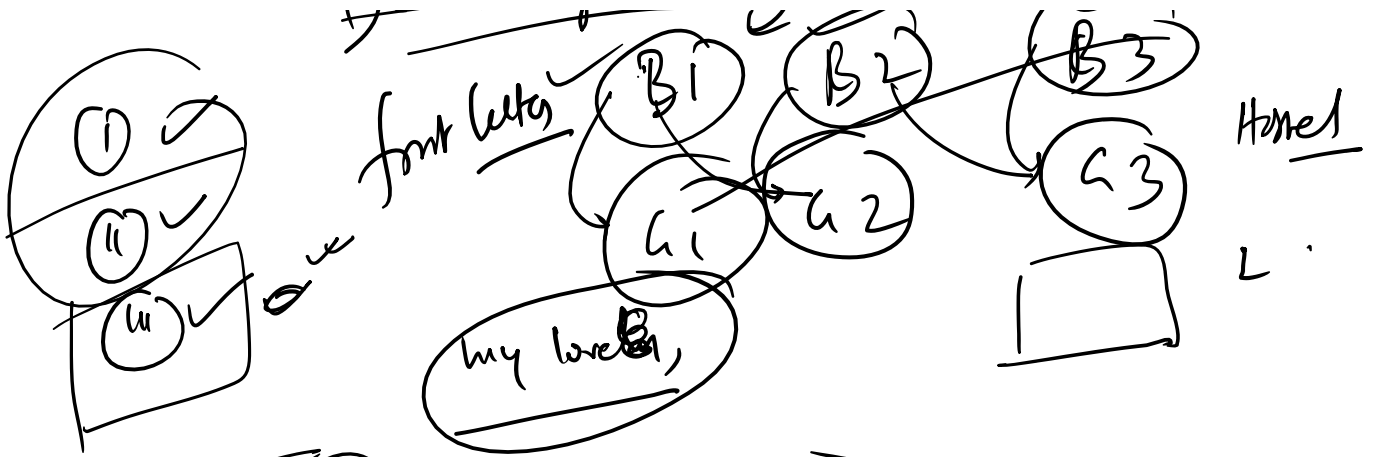


De-arrangement

(B1)

(B2)

(B3)



~~Am (my words)~~

Yours eyes

ways $\rightarrow n! \left(1 - \frac{1}{1!} + \frac{1}{2!} - \frac{1}{3!} \dots (-1)^n \frac{1}{n!} \right)$

3 letters $\frac{3!}{3!} \left(1 - \frac{1}{1!} + \frac{1}{2!} - \frac{1}{3!} \right)$

Math Short cut

(5) (6) $D_n = n! \left(1 - \frac{1}{1!} + \frac{1}{2!} - \dots + \frac{(-1)^n}{n!} \right)$

$D_{n+1} = (n+1)D_n + (-1)^{n+1}$

$= n(D_n + D_n) + (-1)^{n+1}$

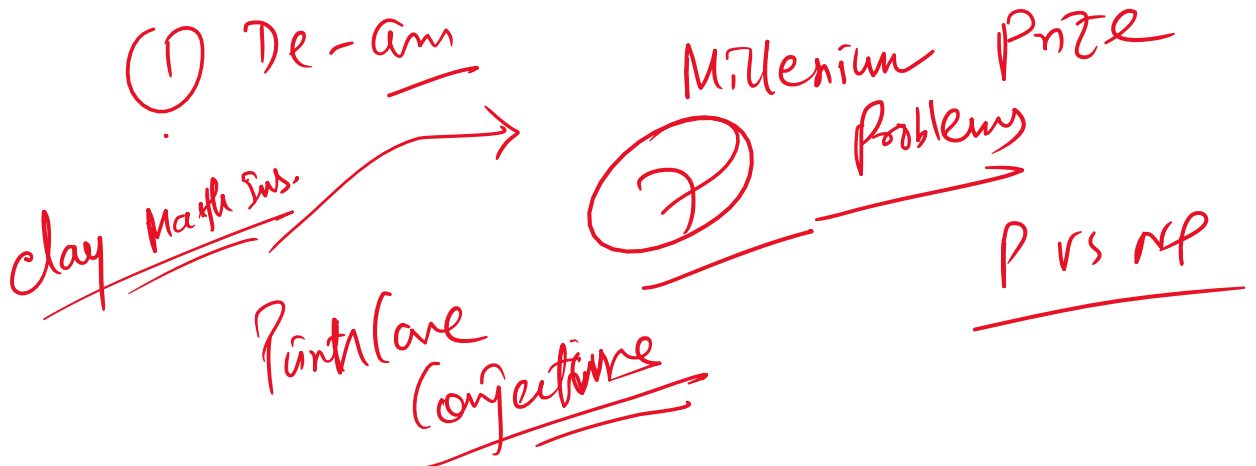
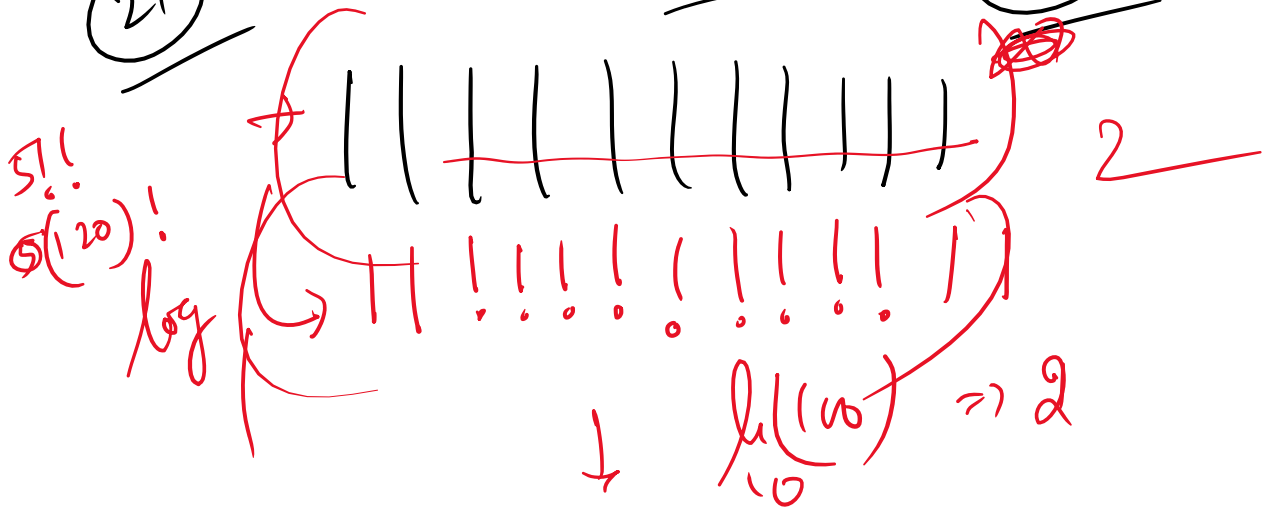
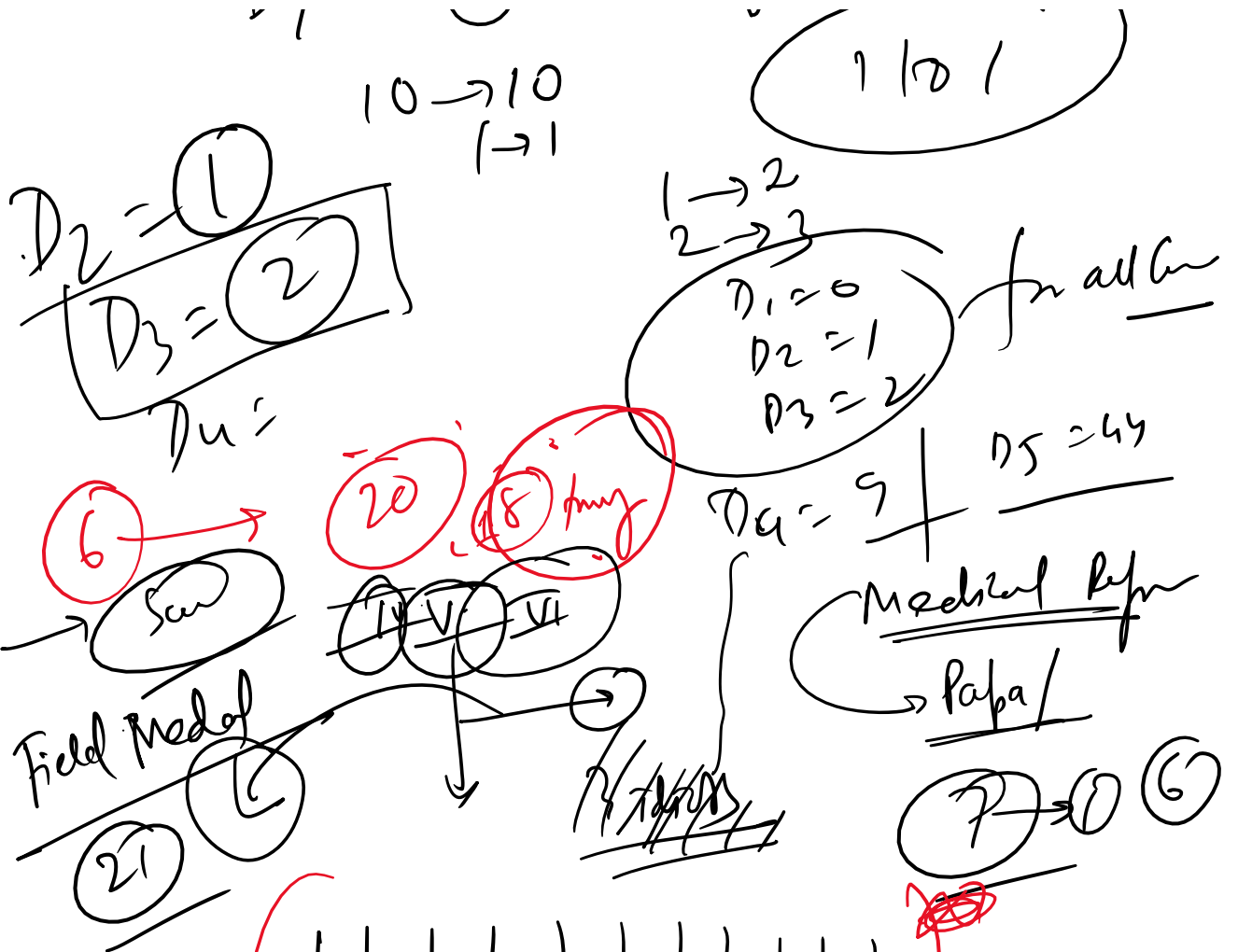
Interactive method

$D_1 = 0$

$10 \rightarrow 10$

Logically??

$(1 | 0 | 1)$



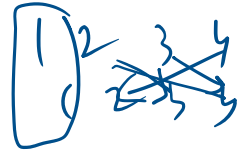
4 books

~~4!~~ → 4.

look out for

4! - 1 - all correct

$(4C_1) \times 2 - (4C_2) \times 1$
 $- (4C_3) \times 0$



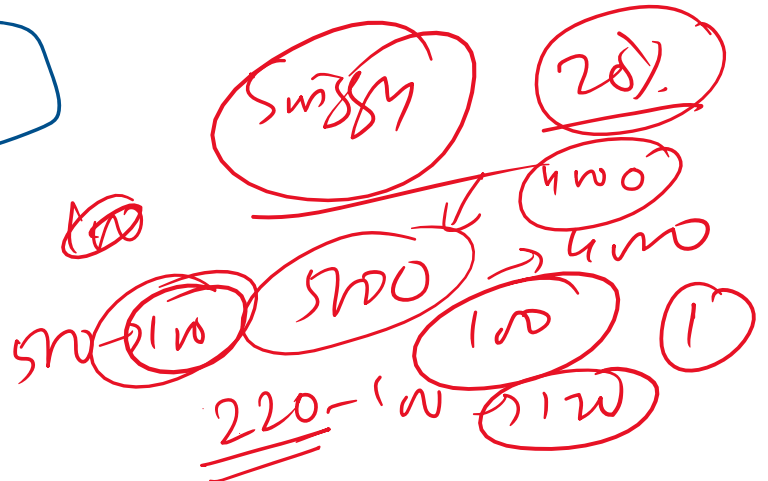
$= 24 - 1 - 8 - 6 - 0$
 $= 24 - 15 = 9$

non-negative gk 50 50 | 50 + 4 - 1 C_{4-1}

look restrictions

Commisses

(A) > >



$x_1 + x_2 + x_3 + x_4 = 29$
 $x_1 \geq 1$
 $x_2 \geq 2$
 $x_3 \geq 3$
 $x_4 \geq 0$
 $29 + 4 - 1 C_3$
 $x_1 = x_1 + 1$
 $x_2 = x_2 + 2$

$$\begin{array}{l}
 \left. \begin{array}{l}
 x_1 \\
 x_2 \\
 x_3
 \end{array} \right\} \begin{array}{l}
 x_1 \\
 x_2 \\
 x_3
 \end{array} \\
 \left. \begin{array}{l}
 y_1 \\
 z_1 \\
 t_1
 \end{array} \right\} \begin{array}{l}
 y_1 = 2x_1 \\
 z_1 = x_1 \\
 t_1 = x_1
 \end{array}
 \end{array}$$

$$\begin{aligned}
 y_1 &= 2x_1 \\
 z_1 &= x_1 \\
 t_1 &= x_1
 \end{aligned}$$

$$2x_1 + y_1 + z_1 + t_1 = 27$$

$$27 + 4 - 1 C_3 = 30 C_3$$

$x_1 + x_2 + x_3 + x_4 + x_5 = 20$

$x_1 + x_2 = 15$

$$\begin{aligned}
 x_3 + x_4 + x_5 &= 5 \quad \checkmark \quad 5 + 3 - 1 C_2 \\
 &= C_2 = 21
 \end{aligned}$$

$$\begin{array}{r}
 21 + 16 \\
 \hline
 37
 \end{array}$$

$$\begin{array}{r}
 16 C_1 \\
 \hline
 16
 \end{array}$$