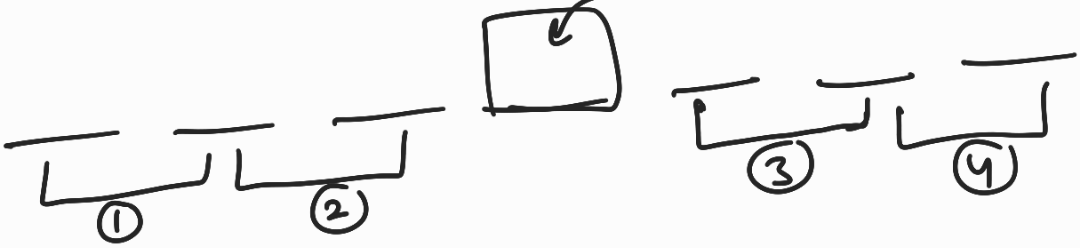
(S-1) P & C

(20) $B_1\ B_2\ G_1, G_2\ G_3\ G_4$ (Grand father)



TOTAL $= 6!$

When Both Boys are together

$$= {}^4C_1\ 2!\ 4!$$

one out of 1 2 3 4

Boys Girls

$$\text{Ans} = 6! - {}^4C_1\ 2!\ 4!$$

(21) (iii) M U L T I P L E

$$\frac{5!}{2!}\ 3!$$

(24) $3^a\ 3^b\ 3^c \longrightarrow$ G.P.

$$(3^b)^2 = 3^a 3^c \Rightarrow 2b = a+c$$

$$a, b, c \in \{1, 2, 3 - - - - - . 101\}$$

$$\downarrow 50 \text{ even} \qquad \downarrow 51 \text{ odd}$$

$$\boxed{a+c = \text{even}} \qquad {}^{50}C_2 + {}^{51}C_2$$

26

$$x = \frac{10!}{5!\,5!} - \frac{8!}{4!\,4!}$$

$$\text{Total} = \frac{18!}{9!\,9!}$$

$$\boxed{\text{Ans} = \text{Total} - x}$$

JA

2

$$S = \{1, 2, 3, 4\}$$

Subsets = A, B

3 choice
A OR B OR ϕ

$$= 3^4 = 81$$

$$\left(\frac{81-1}{2} + 1\right) = 41$$

ϕ

Ex:- $S = \{1, 2\}$

$\phi, \{1\}, \{2\}, \{1, 2\}$

$\phi \cap \{1\}$, $\phi \cap \{2\}$

$\phi \cap \{1, 2\}$, $\{1\} \cap \{2\}$

$\phi \cap \phi$

$A \cap B = \phi$

$\{1\} \cap \{2\} = \phi$ ✓

$\{2\} \cap \{1\} = \phi$ ✓

$\{1,2\} \cap \{3,4\}$

$\{3,4\} \cap \{1,2\}$

$\phi \cap \phi = \phi$ — $\boxed{1}$

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4 5 use 0, 1 $\cancel{0,0}$

0 or 1

$\underset{1}{\_}\ \underset{2}{\_}\ \underset{3}{\_}\ \underset{4}{\_}\ \cdots\ \underset{(n-2)}{\_}\ \underset{(n-1)}{\_}\ \underset{n}{\_}$

$\left\{ \begin{array}{l} \text{use 0, 1 or both} \\ \text{non consecutive 0} \end{array} \right\} = a_n$ n digits numbers

$b_n = a_{n-1}$

$\boxed{\underset{1}{\_}\ \underset{2}{\_}\ \underset{3}{\_}\ \cdots\ \underset{(n-2)}{\_}\ \underset{(n-1)}{\_}}\ \underset{n}{\boxed{1}}$

$c_n = a_{n-2}$

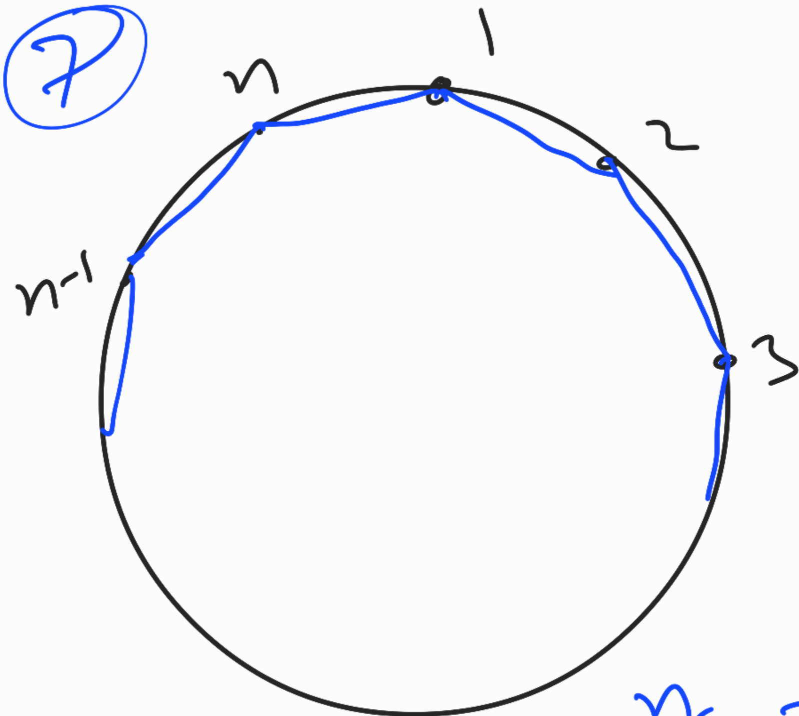
$*\ a_n = b_n + c_n$

$$\boxed{a_n = a_{n-1} + a_{n-2}}$$

$a_4 = a_3 + a_2$

$b_6 = a_5 = a_4 + a_3$

7



${}^nC_2$ = Total

adjecent = n

Sed = ${}^nC_2 - n$

${}^nC_2 - n = n$

8

Letters → 1 2 3 4 5 6

envelopes ⇒ $\boxed{1}$ $\boxed{2}$ $\boxed{3}$ $\boxed{4}$ $\boxed{5}$ $\boxed{6}$

D_6 = All are Derangeme

$1 \to \boxed{2}$ $\quad x$ methods

$1 \to \boxed{3}$ $\quad x$

$1 \to 4$ $\quad x$

$1 \to 5$ $\quad x$

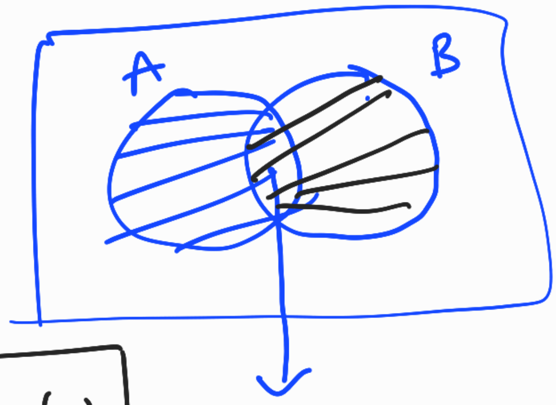
$1 \to 6$ $\quad x$

$5x = D_6$

$x = \frac{D_6}{5}$

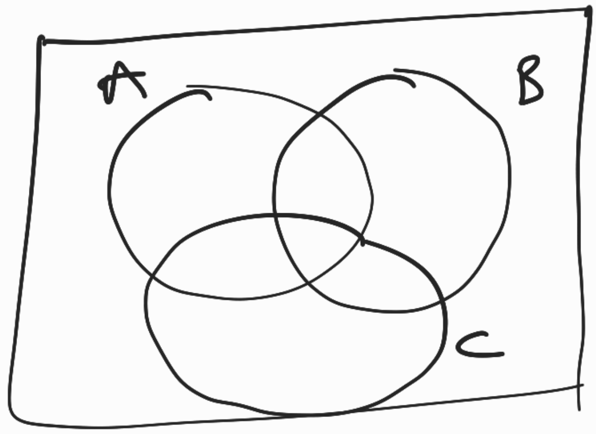
Principle of inclusion and exclusion

$$n(A \cup B) = n(A) + n(B) - n(A \cap B)$$



$A \cap B$

$$n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(B \cap C) - n(A \cap C) + n(A \cap B \cap C)$$



$$n(A_1 \cup A_2 \cup A_3 \cup \cdots \cup A_n)$$

$$= \sum_{i=1}^{n} n(A_i) - \sum n(A_i \cap A_j)$$

$$+ \sum n(A_i \cap A_j \cap A_k) - \sum$$

$$+ \sum \qquad - \sum$$

$$+ \sum \qquad - \sum$$

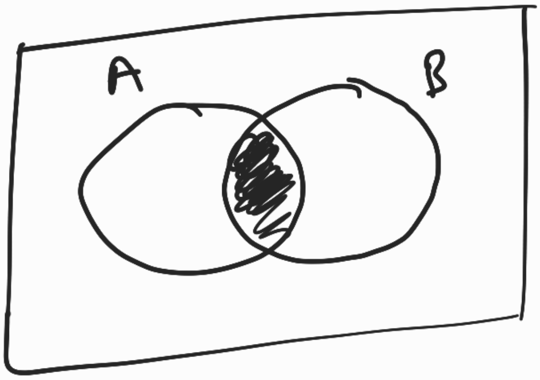
Ex:- a b c d e f g h

Arrange 8 letters such that abc and def never Appear

Sol^n TOTal = 8! (No condition)

abc def g, h

set A SetB



$n(A \cup B) = ??$

$n(A) =$ abc d e f g h

$n(A) = 6!$

$n(B) =$ a b c def g h $= 6!$

$n(A \cap B) =$ abc def g h $= 4!$

$$\boxed{n(A \cup B) = 6! + 6! - 4!}$$

Either abc OR def appear

$Ans = 8! - (6! + 6! - 4!)$

Ex:- "KUTKUT" find number of ways if no two alike letters are together

$$\text{Total} = \frac{6!}{2!\,2!\,2!} = \frac{720}{8} = 90$$

$A \equiv$ KK U T U T $= \frac{5!}{2!\,2!} = 30$

$B \equiv$ UU K T K T $= 30$

$C \equiv$ TT K U K U $= 30$

$A \cap B \equiv$ KK UU T T $= \frac{4!}{2!} = 12$

$B \cap C \equiv$ UU TT K K $= 12$

$C \cap A =$ KK TT U U $= 12$

$A \cap B \cap C = KK \quad UU \quad TT = 3! = 6$

$$n(A \cup B \cup C) = 30 + 30 + 30 - 12 - 12 - 12 + 6$$

$$= 60$$

Ans = TOTAL $-$ $n(A \cup B \cup C)$

$$90 - 60 = 30$$

DERANGEMENT : means arrangement in which none can occupy its own place.

letters = 1 2 $\qquad D_2 = 1$

envelopes $\boxed{1}$ $\boxed{2}$

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letters $\Rightarrow$ 1 2 3 $\qquad$ W = wrong place

envelops $\Rightarrow$ $\boxed{1}$ $\boxed{2}$ $\boxed{3}$ $\qquad$ R = Right place

$$\text{TOTAL} = 3! = 3R + 2R\,1W + 1R\,2W + 3W$$

$$6 = 1 + 0 + {}^3C_1 D_2 + D_3$$

$$6 = 1 + 3\cdot 1 + D_3 = 2$$

$$* \quad D_n = n!\left[\frac{1}{2!} - \frac{1}{3!} + \frac{1}{4!} - \frac{1}{5!} \cdots + (-1)^n \cdot \frac{1}{n!}\right]$$

1 2 3 - - - - - - n → persons

$\boxed{1}$ $\boxed{2}$ $\boxed{3}$ $\boxed{n}$ → Chairs

Total = $n!$ (No condition)

A_1 = Exactly one is at right place

A_2 = — " — 2 ——— " ———

⋮

A_n = — " —— n ——— " ——

$$n! - \left[{}^nC_1\,(n-1)! - {}^nC_2\,(n-2)! + {}^nC_3\,(n-3)! \cdots\right]$$

$$n! - \left[n! - \frac{n!}{2!} + \frac{n!}{3!} \cdots\right]$$

$$= n!\left[\frac{1}{2!}-\frac{1}{3!}+ - - - - +\frac{(-1)^n}{n!}\right]$$

Ex:- $D_6 = 6!\left(\frac{1}{2!}-\frac{1}{3!}+\frac{1}{4!}-\frac{1}{5!}+\frac{1}{6!}\right]$

$$D_6 = 720\left[\frac{360-120+30-6+1}{720}\right]$$

$$D_6 = 265$$

$$D_5 = 44 = 5!\left[\frac{1}{2!}-\frac{1}{3!}+\frac{1}{4!}-\frac{1}{5!}\right]$$

$$D_4 = 9$$

$$D_3 = 2, \quad D_2 = 1$$

Ex:- From a given 6 diff^nt questions each question has only one correct answer. For each correct entry a student will be awarded by 2 marks & for each wrong entry -1

Find Total no. of ways in which a Student can secure non-negative marks

Q_1 A_1

Q_2 A_2

Q_3 A_3

Q_4 A_4

Q_5 A_5

Q_6 A_6

All CORRECT = 1

5C 1 incorrect = 0

4C 2 incorrect = $^6C_4 \cdot D_2 = 15$

3C 3 incorrect = $^6C_3 \, D_3 = 40$

$\underbrace{2C}_{+4}$ $\underbrace{4 \text{ incorrect}}_{-4}$ = $^6C_2 \cdot D_4 = 135$

+4 −4 = 0