

# PROBABILITY

का

# CONCEPT

ऐसे कभी नहीं पढ़ा होगा

 सब खल्लास 





Probability (प्रायिकता)

Measurement of uncertainty

Concept

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①

Experiment (प्रयोग)



Random Experiment

Result depend on chance

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②

Sample Space (प्रतिदर्श समष्टि)

Set of all possible outcomes

सभी संभव परिणाम का समुच्चय

$$P(H) = \frac{1}{2} \\ = 50\% \\ = 0.5$$

उ.१

1 coin [H, T]

2 coin [HH, TT, HT, TH]

1 dice [1, 2, 3, 4, 5, 6]

$n(S)$   
2  
4  
6

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③ Event  $\rightarrow$  any subset (उपसमूचाय)  
of Sample Space

e.g Card experiment

[♥, ♦, ♣, ♠]

King आना event

$n(E) = 4$

$$n(S) = 52$$

$$n(E) = 4$$

$$P(K) = \frac{4}{52}$$

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$$\text{Probability} = \frac{n(E) \rightarrow \text{Favourable Outcomes}}{n(S) \rightarrow \text{Total no. of outcomes}}$$

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$$0 < P < 1$$

$$0 \leq P < 1$$

$$0 \leq P \leq 1$$

→ Probability of sure event is 1  
e.g आज Monday है तो कल Tuesday

→ Probability of impossible event is 0

e.g Dice पर 7 आना

Any event  
 $0 \leq P \leq 1$

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④

Simple event

E.g Dice पर 4 आना। बार

$[1, 2, 3, 4, 5, 6]$

$[4]$

Compound event

E.g getting even no.

$[2, 4, 6]$

↓  
more than one

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⑤ Equally likely

$(H, T)$

$$P(H) = P(T) = \frac{1}{2}$$

Not equally likely  
 $(H, T)$   $(1, 2, 3, 4, 5, 6)$

$$P(H) = \frac{1}{2} \quad P(4) = \frac{1}{6}$$

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# 4 प्रकार के Question

① केवल 1 निकाला जाय

eg [1,2,3,4,5,6] 2 आने की Probability??

$P(2)$

$$P(E) = \frac{n(E)}{n(S)}$$

(Addition Rule)

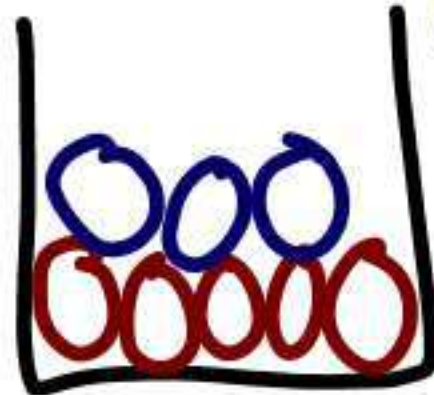
② A or B

Mutually Excl.

Non mutually Excl.

$P(A \text{ or } B)$

eg



या  
कोई रुक

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③ 2 या 1 से अधिक चीजें निकालना एक साथ  
Multiplication rule  
(A and B)  
आर  
Independent (replacement) ✓  
Dependent (no replacement)

E.g दो coins उछाले पहले पर Head दूसरे पर Tails

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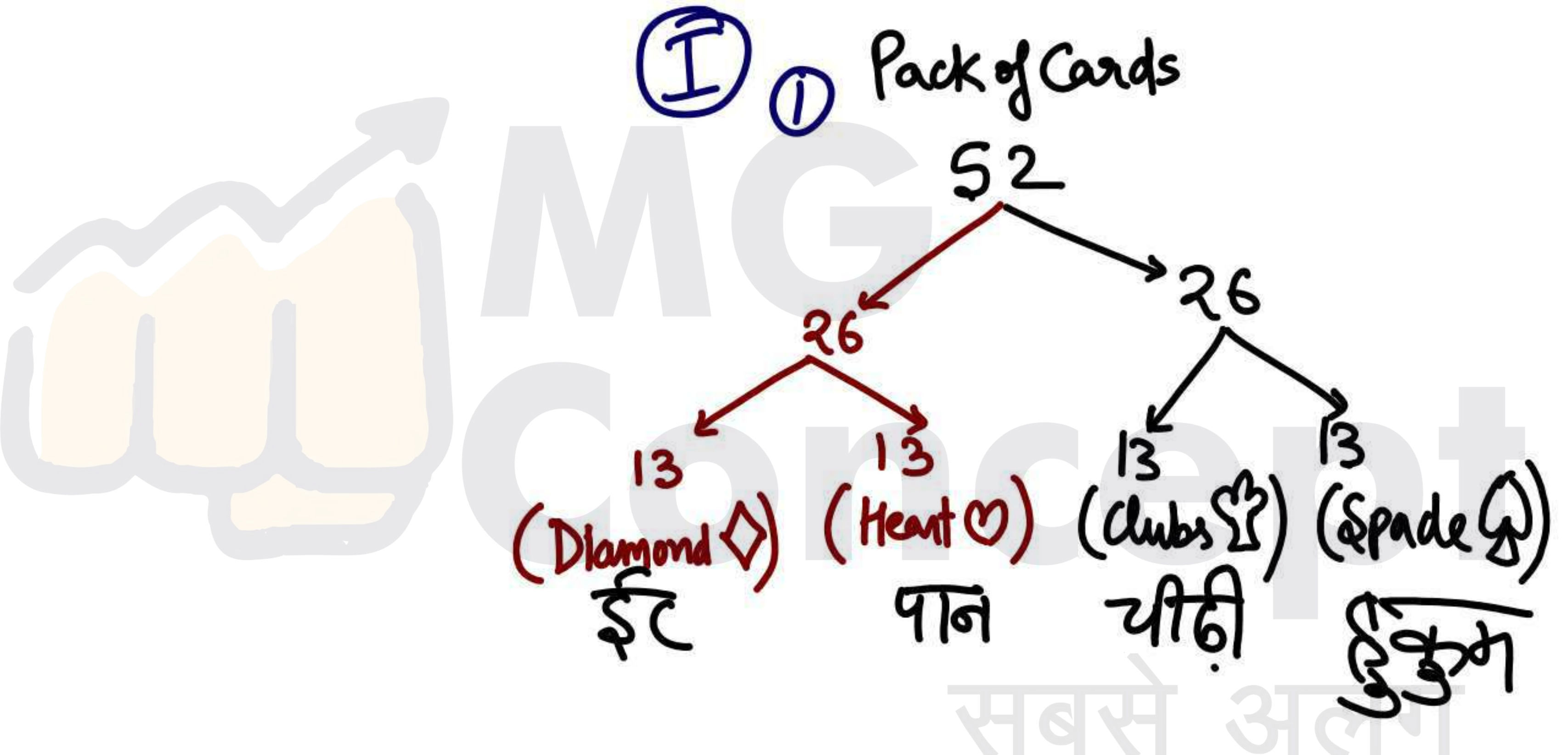
ये एक  
easy तरीका  
है m(e) और  
n(s) निकालने  
का

④ Combination more than 1, उसमें  
भी choice  $\Rightarrow$  choice पर choice

e.g alphabet में 2 letter निकालने हैं  
उसमें भी 1<sup>st</sup> vowel दूसरा Consonant

→ जहाँ Selection की बात आरंभ

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↳ Face Cards J, Q, K

$$3 \times 4 = 12$$

↳ Honour Card A, J, Q, K

$$4 \times 4 = 16$$

↳ A ↓ Ace    J ↓ Jack    Q ↓ Queen    K ↓ King

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$$P(E) = \frac{n(E)}{n(S)}$$

$$n(S) = 52$$

1 Card निकला  
है

$$\textcircled{1} P(\text{Red Card}) = \frac{26}{52}$$

$$\textcircled{2} P(\text{Black Card}) = \frac{26}{52}$$

$$\textcircled{3} P(\text{King}) = \frac{4}{52}$$

$$\textcircled{4} P(\text{Club}) = \frac{13}{52}$$

$$\textcircled{5} P(\text{Q of Heart}) = \frac{1}{52}$$

$$\textcircled{6} P(2) = \frac{4}{52}$$

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$$\textcircled{7} P(\text{Red King}) = \frac{2}{52}$$

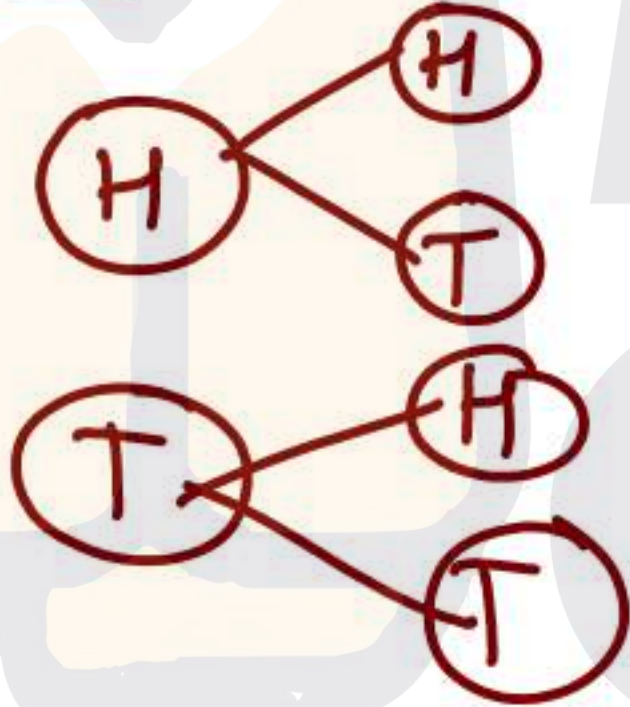
$$\textcircled{8} P(\text{Honour Card}) = \frac{16}{52}$$

$$\textcircled{9} P(\text{Face Card}) = \frac{12}{52}$$

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Coin  
H T



② 2 Coins

[HH, HT, TH, TT]

Cases =  $2^n$

→ 4 cases  
 $n(s) = 4$

①  $P(1H) = \frac{2}{4}$

②  $P(2H) = \frac{1}{4}$

③  $P(3H) = 0$

④  $P(\text{atleast } 1H) = \frac{3}{4}$   
1H 2H

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$$1 - P(\text{all Head}) \leftarrow$$
$$1 - \frac{1}{4} = \frac{3}{4}$$

$$\textcircled{5} P(\text{atmost 1H}) = \frac{3}{4}$$

0H 1H

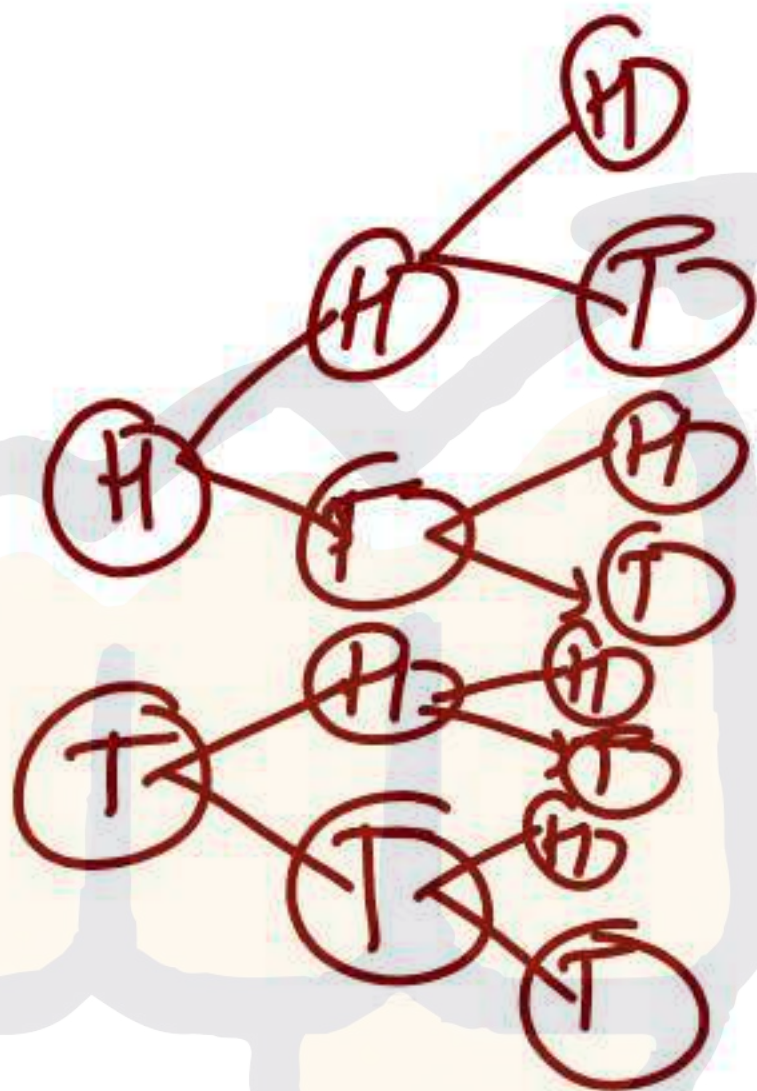
$$\textcircled{6} P(\text{no H}) = \frac{1}{4}$$

$P(\text{all T})$

Concept

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③ 3 coins

$2^3 \rightarrow 8 \text{ cases}$

[HHH, HHT, HTH, HTT, THH, THT, TTH, TTT]

$n(S) = 8$

①  $P(1H) = \frac{3}{8}$

②  $P(2H) = \frac{3}{8}$

③  $P(3H) = \frac{1}{8}$

④  $P(4H) = 0$

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$$\textcircled{5} P(\text{all T}) = \frac{1}{8}$$

$$\textcircled{6} P(\text{almost 1H}) = \frac{4}{8}$$

$$\textcircled{7} P(\text{almost 2H}) = \frac{7}{8}$$

$$1 - P(\text{all T})$$

$$1 - \frac{1}{8} = \frac{7}{8}$$

$$\textcircled{8} P(\text{at least 1H}) = \frac{7}{8}$$

$$\textcircled{9} P(\text{at least 2H}) = \frac{4}{8}$$

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④ 1 Dice  $\rightarrow 6^n$  cases

$6^1 =$  1 2 3 4 5 6

$n(S) = 6$

①  $P(\text{even No}) = \frac{3}{6}$

②  $P(\text{odd No}) = \frac{3}{6}$

③  $P(\text{Prime No}) = \frac{3}{6}$

④  $P(\text{multiple of 3}) = \frac{2}{6}$

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$$\textcircled{5} P(\text{composite No.}) = \frac{2}{6}$$

$$\textcircled{6} P(\text{more than 3}) = \frac{3}{6}$$

$$\textcircled{7} P(\text{less than 7}) = 1$$

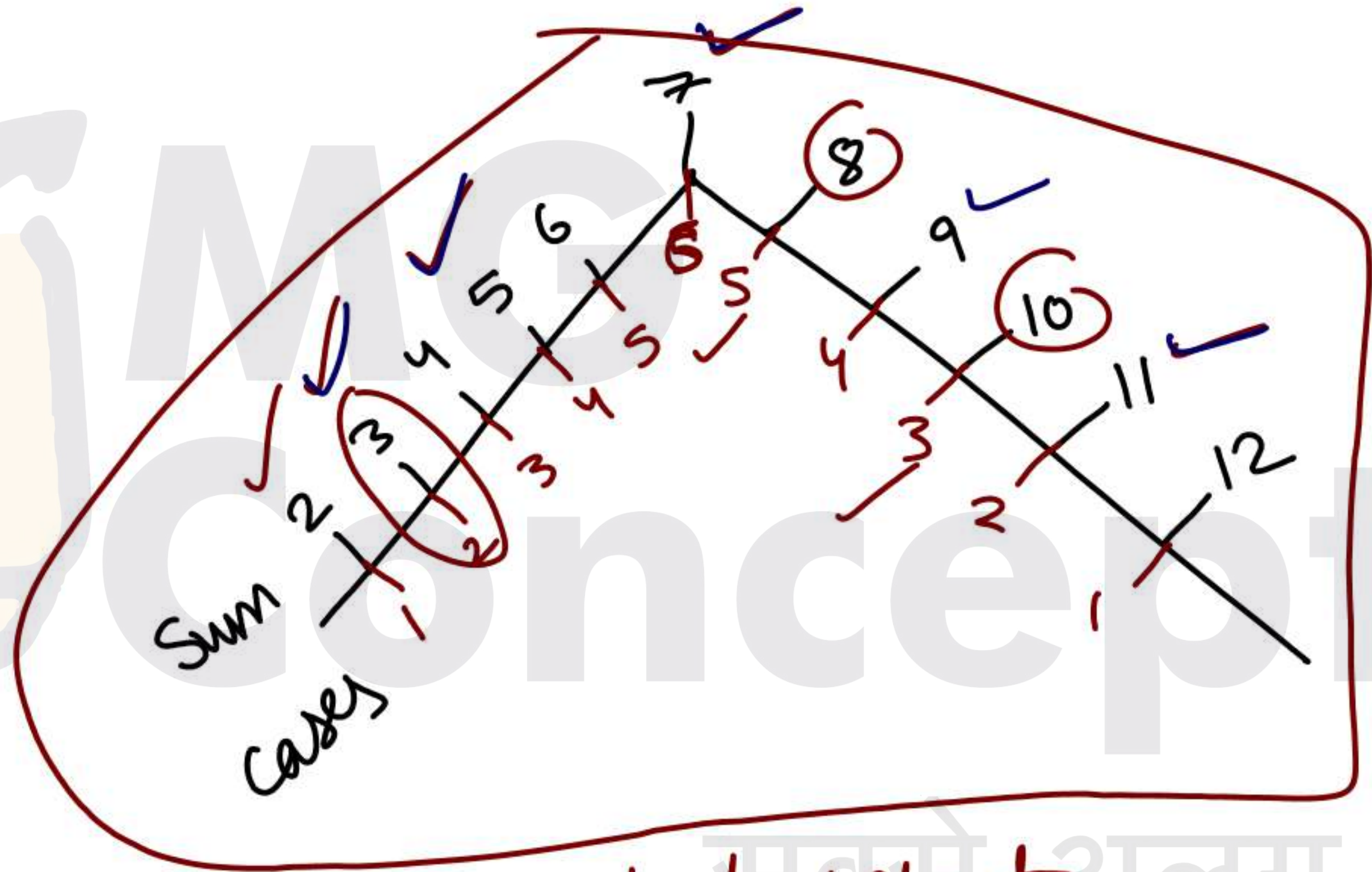
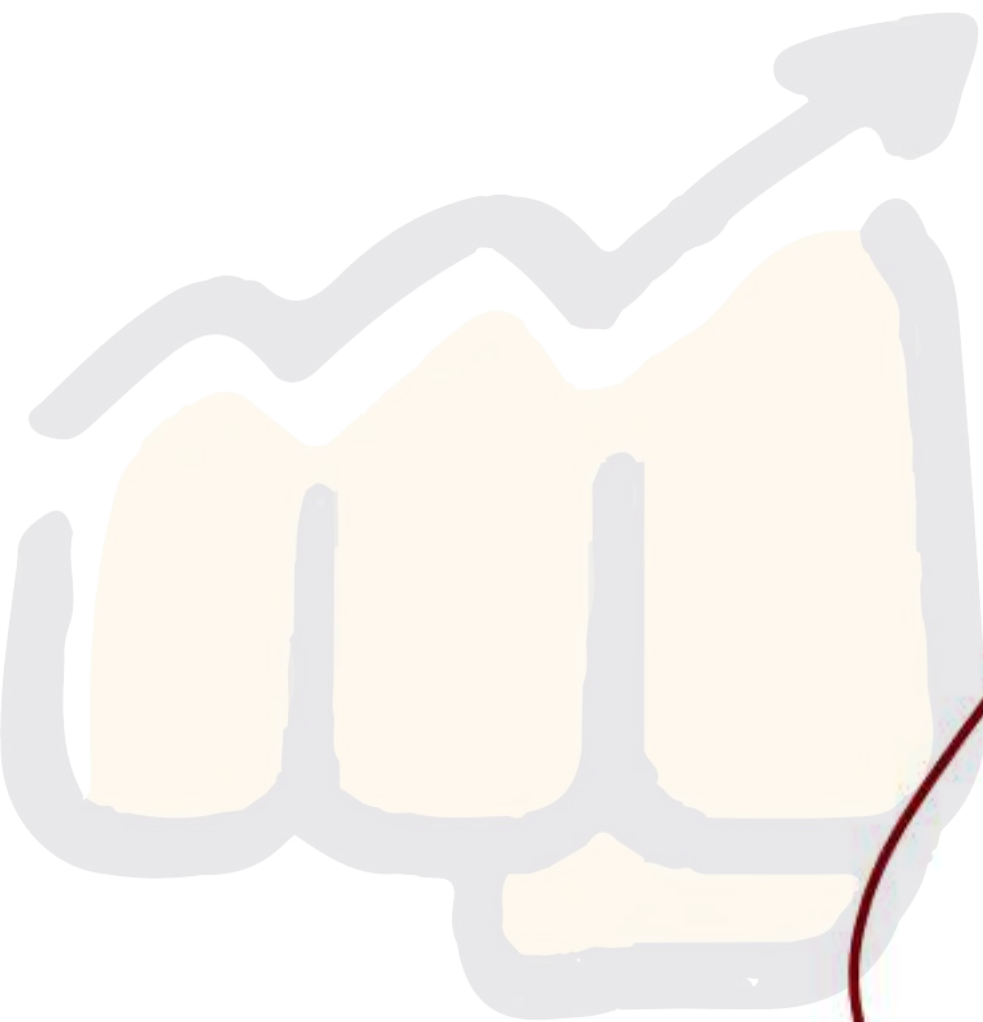
$$\textcircled{8} P(\text{more than 6}) = 0$$

Sure event

Impossible event

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Important Chart

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Cases  $6^2 = 36 = n(S)$

## ⑤ 2 Dice (Special)

①  $P(\text{Sum } 5) \rightarrow \frac{4}{36}$

②  $P(\text{Sum } 6) \rightarrow \frac{5}{36}$

③  $P(\text{Sum of 3 at both dice}) \rightarrow \frac{2}{36}$

④  $P(\text{Same no. on both dice}) \rightarrow \frac{6}{36}$

(1,1) (2,2) (3,3) (4,4)  
(5,5) (6,6)

⑤  $P(\text{Sum as prime no.}) = \frac{15}{36}$

⑥  $P(\text{Sum more than 6}) \rightarrow \frac{21}{36}$

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⑦  $P(\text{sum } 8 \text{ or } 10) = \frac{8}{36}$

⑧  $P(\text{sum as odd no.}) = \frac{18}{36}$

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⑨  $P(\text{not getting sum 7 or 11})$

$$1 - P(7 \text{ or } 11)$$

$$1 - \frac{8}{36} = \frac{28}{36}$$

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## ② Addition Rule

कोई एक event है

$P(\text{any of them})$

$P(A \cup B)$

$P(A \text{ or } B)$

$P(A + B)$

$P(\text{either } A \text{ or } B)$

$P(\text{at least one of them})$

(II)

## Addition Rule

Mutually Exclusive

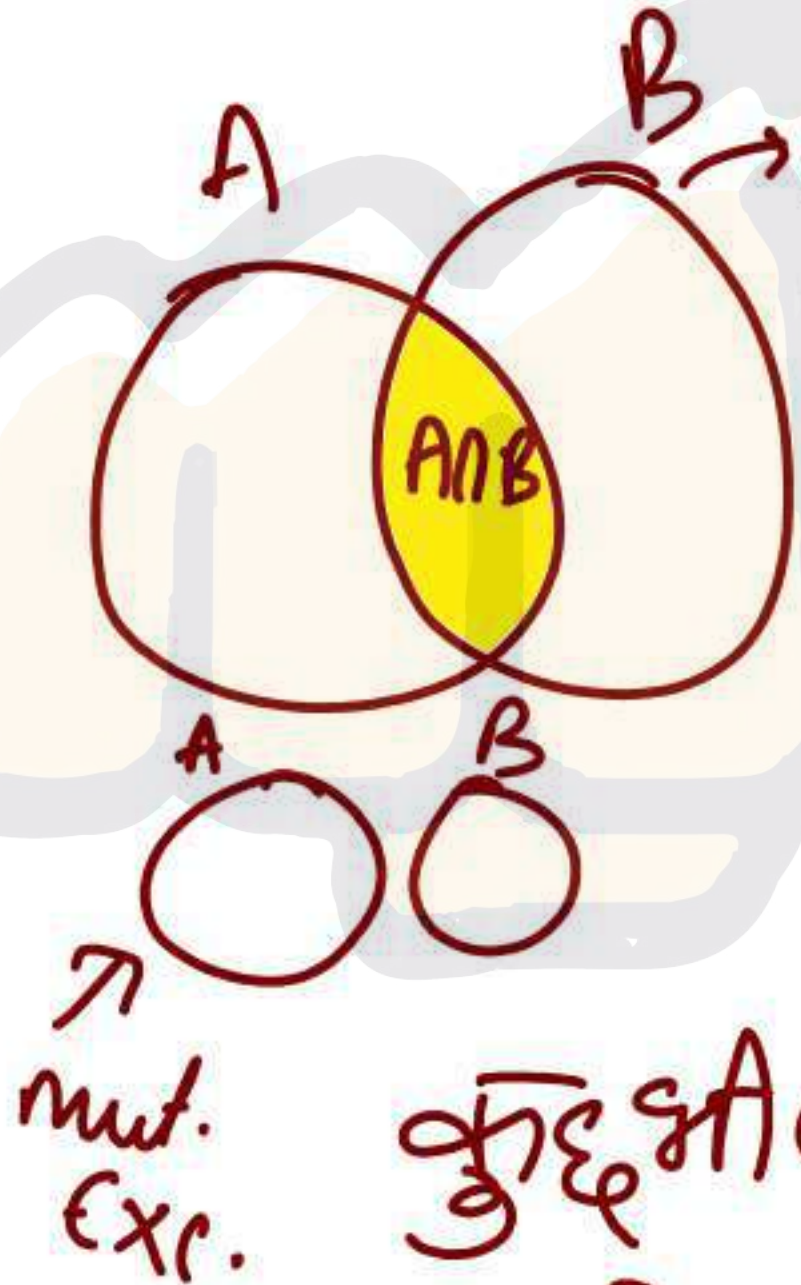
→ कुछ भी Common न हो दो event में  
e.g. Dice फेंकने पर  
1 या prime no. आना

$$\begin{aligned} &\rightarrow P(A \cup B) = P(A) + P(B) \\ &\rightarrow P(A \cap B) = 0 \end{aligned}$$

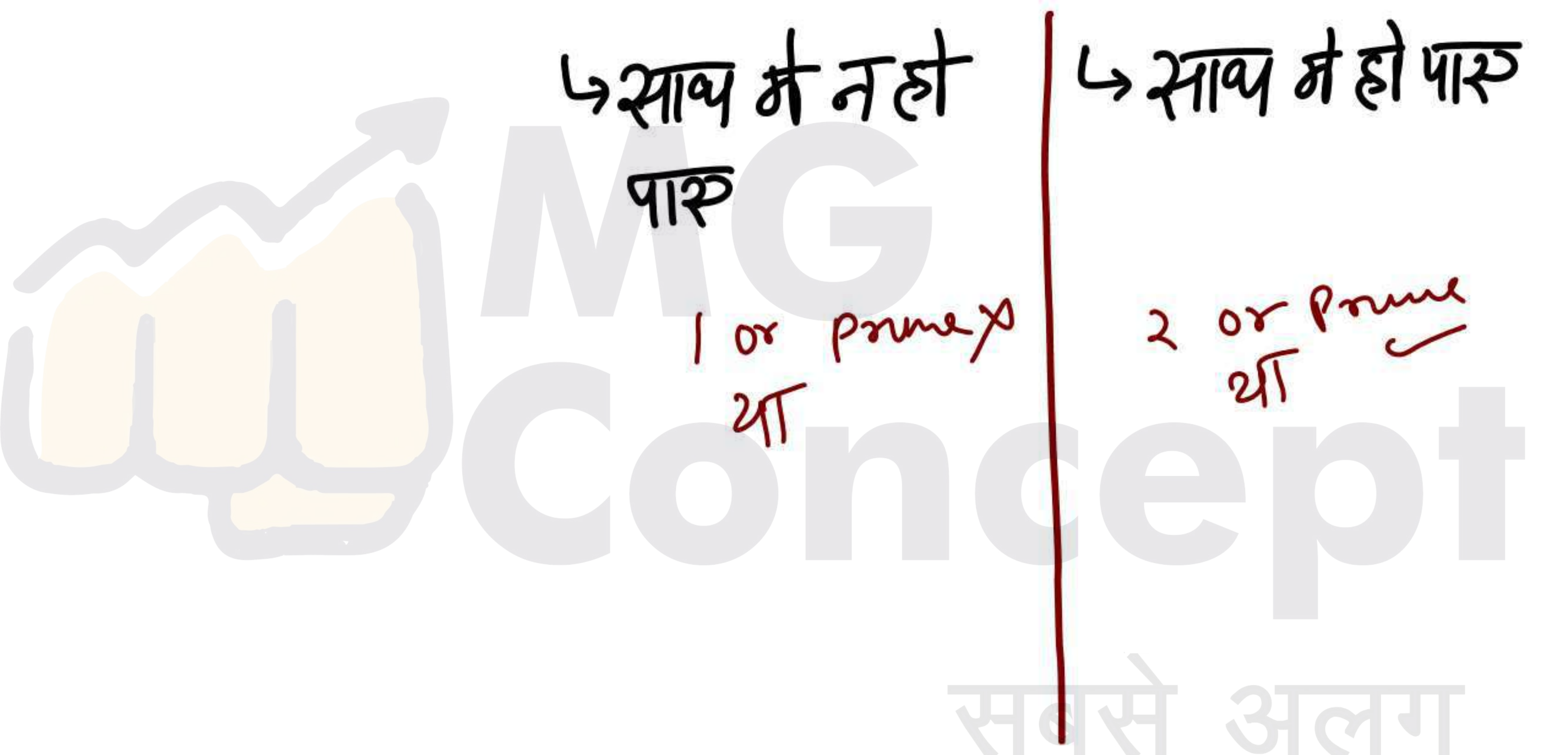
Non-Mutually Exclusive

→ कुछ Common हो दो event में  
e.g. Dice फेंकने पर  
Even या prime no. आना

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



कुछ भी Common नहीं



↳ साव्य में न हो

पारु

1 or prime ~~x~~

था

↳ साव्य में हो पारु

2 or prime ✓

था

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$$n(S) = 52$$

①  $P(\text{Ace or King}) \rightarrow \underline{M.E}$

$$\frac{4}{52} + \frac{4}{52} = \frac{8}{52}$$

②  $P(\text{Heart or Spade}) \rightarrow \underline{M.E}$

$$\frac{13}{52} + \frac{13}{52} = \frac{26}{52}$$

③  $P(\text{Queen or Red}) \rightarrow \underline{N.M.E}$

$$\frac{4}{52} + \frac{26}{52} - \frac{2}{52} = \frac{28}{52}$$

④  $P(A \text{ or } K \text{ or } Q) \rightarrow \underline{\underline{M.E}}$

$\downarrow$   
 $\frac{4}{52} + \frac{4}{52} + \frac{4}{52}$

$\frac{12}{52}$

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### ③ Multiplication Rule

↓  
दोनों event होंगे एक साथ

$P(A \cap B)$

$P(A \text{ and } B)$

$P(\text{A as well as B})$

$P(\text{Both of them})$

$P(A \text{ and } B)$

# Multiplication Rule

## Independent Event

↳ with replacement

↳ एक का दूसरे पर effect नहीं होगा

## Dependent Events

↳ without replacement

↳ एक का दूसरे पर effect होगा

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$$\hookrightarrow P(A \cap B) = \underline{P(A) \times P(B)} \quad \hookrightarrow P(A \cap B) = P(A) \times P\left(\frac{B}{A}\right)$$

$\uparrow$   
 Conditional Prob.  
 B की Probab.  
 जब A हो चुका है

e.g. 2 cards से 2 card  
 निकाले J और K  
 होने की Prob.

with replacement

$$\left(\frac{4}{52}\right) \times \left(\frac{4}{52}\right)$$

e.g. Same without replacement

$$\left(\frac{4}{52}\right) \times \left(\frac{4}{51}\right)$$

① 2 coin tossed 1 Head और 1 Tail  
की Prob. (Indep.)

$$P(H \& T) = \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$$

② 2 Card निकाले गए 1 Ace और 1  
King. (Indep.)

$$\frac{4}{52} \times \frac{4}{52} \text{ सबसे अलग}$$

③ 1 Ace and 1 King without replacement  
(Dependent)

$$\frac{4}{52} \times \frac{4}{51}$$

④ Both Ace

replaced

$$\frac{4}{52} \times \frac{4}{52}$$

without replaced

$$\frac{4}{52} \times \frac{4}{51}$$

$$P(E) = \frac{n(E)}{n(S)}$$

# Probability

- Events
- Formula
- Types of ques. (4)

(किन्ती event  
(or))

2C, 3C, 1D, 2D, 52

SET 2 मात्र

## Addition Rule

M.E  
Common

N.M.E  
Common

## Multiplication (and) Rule

Indep  
With replac / Without  
replace

Dep.

## ④ Combination पर आधारित

↳ जहाँ No. of ways सीधा ना  
निकाला जा सके

↳  $n$  में से  $r$  select करने के  
तरीके  $nC_r = \frac{n!}{r!(n-r)!}$

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

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e.g

5W 4R 2G

Total 11 balls

②

$$n(S) = {}^{11}C_2$$

$$n(E) = {}^4C_2$$

$$\textcircled{1} 1R = \frac{{}^4C_2}{{}^{11}C_2}$$

$$\textcircled{2} 2R = \frac{{}^4C_2}{{}^{11}C_2}$$

$$n(S) = {}^{11}C_3$$

$$n(E) = {}^5C_3$$

$$\textcircled{3} 3W = \frac{{}^5C_3}{{}^{11}C_3}$$

$$n(S) = {}^{11}C_4$$

$$\textcircled{4} 2W \& 2R = \frac{{}^5C_2 \times {}^4C_2}{{}^{11}C_4}$$



⑤  $3W \& 2R \& 2G$

$$= \frac{{}^5C_3 \times {}^4C_2 \times {}^2C_2}{{}^{11}C_7}$$

Concept

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$${}^{10}C_9 = {}^{10}C_1 = 10$$

$${}^5C_0 = {}^5C_5 = 1$$

कुछ Combination की  
Special तकनीक

$$\begin{aligned} &\boxed{\hookrightarrow 0! = 1} \\ &\boxed{\hookrightarrow 1! = 1} \end{aligned}$$

$$\hookrightarrow {}^nC_{n-1} = {}^nC_1 = n$$

$$\hookrightarrow {}^nC_n = {}^nC_0 = 1$$

$$\hookrightarrow {}^nC_n = {}^nC_{n-n}$$

$$\downarrow$$

$${}^{10}C_3 = {}^{10}C_7$$

अलग

Most used

$${}^{20}C_4 = \frac{20 \times 19 \times 18 \times 17}{4 \times 3 \times 2 \times 1}$$

$${}^{12}C_4 \rightarrow \frac{12 \times 11 \times 10 \times 9}{4 \times 3 \times 2 \times 1}$$

$${}^{15}C_3 = \frac{15 \times 14 \times 13}{3 \times 2 \times 1}$$

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