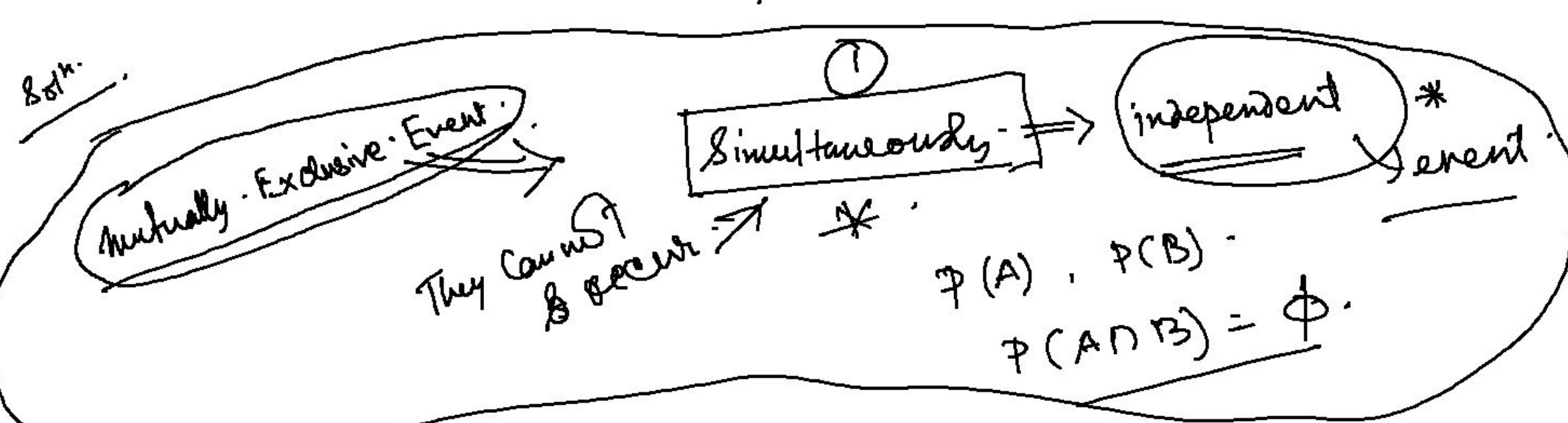


Conditional Probability and it's examples

Examples: Three cards are drawn at random from a pack of 52 cards find the probability of getting. 1. 2 ace, 2. 2 spades, 3. one spade, one club, & one diamond. 4. Two face cards. 5. at least one king



- Axioms:
- $0 \leq P(A) \leq 1$
 - $P(S) = 1$ → Certain events.
 - For a finite or countably infinite no. of pairwise mutually exclusive events $A_1, A_2, A_3, \dots, A_n$ of S
 $P(A_1 \cup A_2 \cup \dots \cup A_n) = P(A_1) + P(A_2) + \dots + P(A_n)$
 $\Rightarrow P(A_1) + P(A_2) + P(A_3) + \dots + P(A_n)$

Conditional probability: Let S be a sample space of a random experiment E . and considering A and B be two events connected with E . such that $P(A) > 0$. Then the probability of occurrence of B on the hypothesis of the event A has actually occurred is called conditional probability of B .

* for two events A and B connected with a random experiment E . Then the probability of their simultaneous occurrence = $P(A) \cdot P(B|A)$ (conditional probability of B on the hypothesis of the event A).

$$P(A \cap B) = P(A) \cdot P(B|A)$$

$$P(B|A) = \frac{P(A \cap B)}{P(A)} \quad \because P(A) \neq 0$$

* Both

- Total no. of cards = 52. 3 cards are drawn at random. \Rightarrow (2 ace + 1 other card)
 let A be the event of getting 2 ace. $P(A) =$ (out of 4 ace cards 2 are drawn)
 Total no. of sample space = 52. $\Rightarrow 4C_2$ ways. Cards can be drawn.
 3 cards are drawn $52C_3$ ways.
 (52-4) = 48 other cards are remaining.
 one card is taken out of 48 cards in $48C_1$ ways.

$$P(A) = \frac{4C_2 \times 48C_1}{52C_3}$$

- 2 spades? Let B be the event, 13 spade cards. out of which 2 are drawn randomly. in $13C_2$ ways. remaining cards = (52-13) = 39 cards out of which one is selected randomly. in $39C_1$ ways.

$$P(B) = \frac{13C_2 \times 39C_1}{52C_3}$$

- one spade, one club, one diamond. $13C_1 \times 13C_1 \times 13C_1$

- let the event be D of getting two face cards. Total face cards = 12 out of which 2 are selected randomly. in $12C_2$ ways.

now. from rest of the cards one is selected at random. in $(52-12) = 40C_1$ ways.

$$\text{Hence } P(D) = \frac{12C_2 \times 40C_1}{52C_3}$$

- at least one king. $\left\{ 1 - P(\text{no king}) \right\} = \text{at least one king}$
 $\left(1 - \frac{40C_3}{52C_3} \right) = ?$

Probability of no king

$$\left(\frac{40C_3}{52C_3} \right)$$

(at least) → minimum one exists. may exist more than that.

no. king

$$1 - \left(\frac{40C_3}{52C_3} \right)$$

