Basic Definitions :-

1- Classical: $P(A) = \frac{\text{num of elements of } A}{\text{" " " } S}$

Where A: an event
S: Sample space

2- Relative Frequency $\Rightarrow$ $P(A) = \lim_{n \to \infty} \frac{\text{num of trials A occurs}}{\underbrace{n}_{\text{number of trials}}}$

3- subjective

4- Axiomatic:-

$P(A) \geq 0$

$P(S) = 1$

$P(A \cup B) = P(A) + P(B)$ $\longrightarrow$ if A & B are disjoint ($A \cap B = \emptyset$)

$P(A^c) = 1 - P(A)$

$P(\emptyset) = 0$

if A & B are not disjoint then:-

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

if A & B & C " " " :-

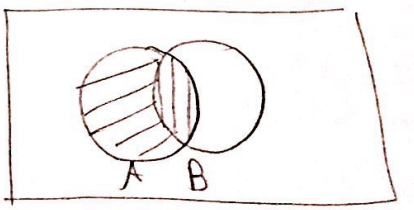
$\rightarrow P(A \cap B) = 0$, $P(A \cap C) = 0$, $P(B \cap C) = 0$

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

Conditional probability :-

$P(A/B)$ means prob of A given B

$P(A/B) = \frac{P(A \cap B)}{P(B)}$



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Bay's Theorem:

$$P(A|B)\,P(B) = P(B|A)\,P(A)$$

Chain rule:-

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

$$P(A \cap B \cap C) = P(A)\,P(B|A)\,P(C|A,B)$$
$$= P(B)\,P(A|B)\,P(C|A,B)$$
$$= P(C)\,P(A|C)\,P(B|A,C)$$

statically independant:- احتمالية أحدهما لا تعتمد على الأخرى

$$P(A) = P(A|B) \quad \text{or} \quad P(B|A) = P(B) \quad \text{or} \quad P(A \cap B) = P(A)P(B)$$

for three events:-

$$P(A \cap B) = P(A)P(B)$$
$$P(A \cap C) = P(A)P(C)$$
$$P(B \cap C) = P(B)P(C)$$
$$P(A \cap B \cap C) = P(A)P(B)P(C)$$

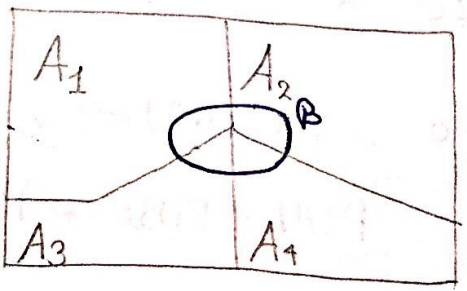
← يجب التحقق منهم كلهم

Morghan's law:-

$$\overline{A \cup B} = \bar{A} \cap \bar{B}$$
$$\overline{A \cap B} = \bar{A} \cup \bar{B}$$

Theorem of Total Probability:-

$$P(B) = P(A_1)\,P(B|A_1) + P(A)_2\,P(B|A_2)$$
$$+ P(A_3)\,P(B|A_3) + P(A_4)\,P(B|A_4)$$



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Counting Techniques:

→ Multiplication Rule :-

You have two events (A, B) in sequence, the way to know how many ways you can arrange or preform the sequence is $n_1 \times n_2$

where n_1 : ways A can be preformed
n_2 " B " " "

Expirement n: number of ... (floors, balls...
K: " " Trials

No replacement
Sample Space = n!
order Imp
permutations
$P_k^n = \frac{n!}{(n-k)!}$

order Not Imp
Combinations
$\binom{n}{k} = \frac{n!}{(n-k)!\,k!}$

Replacement is allowed
Sample space = n^k
$N = n^k$

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