TOPIC : 1.2 – Conditional Probability

Conditional probability :-

The Conditional probability of $A|B$ (given B) is $P(A|B) = \frac{P(A\cap B)}{P(B)}$

$P(B) \neq 0$

$B|A$ (given A) is $P(B|A) = \frac{P(A\cap B)}{P(A)}$, $P(A) \neq 0$

Note:

Multiplication rule:

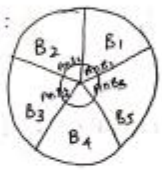
$$P(A\cap B) = \begin{cases} P(A|B) \cdot P(B), & P(B) \neq 0 \\ P(B|A) \cdot P(A) & P(A) \neq 0 \end{cases}$$

Thm of total probability :-

If $B_1, B_2 \ldots B_n$ be a set of exhaustive and mutually Exclusive event and A is another event associated withe B_i then

$$P(A) = \sum_{i=1}^{n} P(B_i) \cdot P(A/B_i)$$

Proof:



The inner circle represents the event A

A can occur along with $B_1, B_2 \ldots B_n$ that are exhaustive & mutually exclusive.

$\therefore AB_1, AB_2, AB_3 \ldots AB_n$ are also mutually exclusive

$\therefore A = AB_1 + AB_2 + AB_3 + AB_n$ (By addition thm)

$$P(A) = P(\sum AB_i)$$

$$= \sum P(AB_i)$$

$$= \sum_{i=1}^{n} P(B_i) \times P(A/B_i)$$