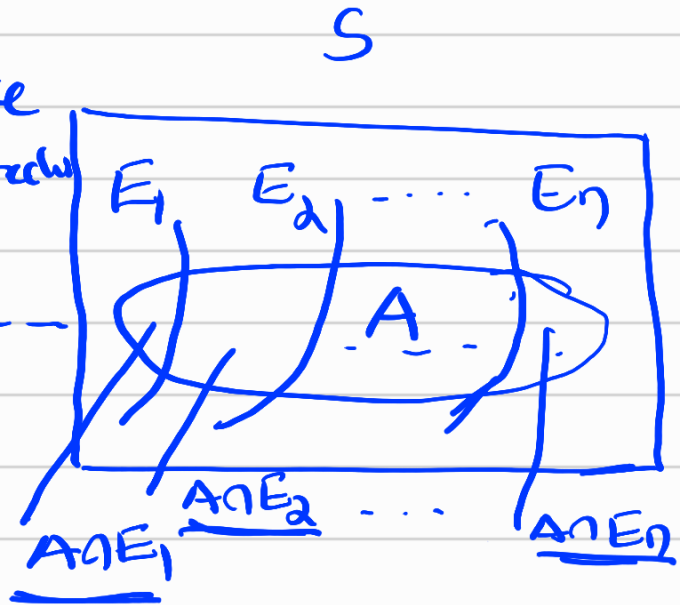# Total Probability

Let S be the Sample Space
Let $E_1, E_2 \cdots E_n$ mutually exclusive
events and Let event
A occure with $E_1, E_2 - -$
E_n
       then

$A \cap E_1$ $A \cap E_2 \cdots$ $A \cap E_n$

Probability of occurrence of event A

$$P(A) = P(A \cap E_1) + P(A \cap E_2) + \cdots + P(A \cap E_n)$$

$$= P(E_1) \cdot P(A/E_1) + P(E_2) P(A/E_2) + \cdots + P(E_n) P(A/E_n)$$

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

\# Three machines I, II, III produce 40%,
30%, 30% of the total no. of items
of factory. The percentage of defective
items of the machines are 4%, 2%, 3%.
If an item is selected at random,
find the probability that the item is
defective.

Let A = event that the machine - I ✓

B = " " " II

C = " " " III

Let D be the event which denotes the
defective

Given $P(A) = 40\% = \dfrac{40}{100} = 0.40$

$P(B) = 30\% = \dfrac{30}{100} = 0.30$

$P(C) = 30\% = \dfrac{30}{100} = 0.30$

Given $P(D|A) = 4\% = \dfrac{4}{100} = 0.04$

$$P(D|B) = 2\% = \frac{2}{100} = 0.02$$

$$P(D|C) = 3\% = \frac{3}{100} = 0.03$$

$$P(D) = P(A) \cdot P(D/A) +$$
$$P(B) \cdot P(D|B) +$$
$$P(C) \cdot P(D|C)$$
$$= (0.40)(0.04) + (0.30)(0.02) +$$
$$(0.30)(0.03)$$

$$= 0.031$$

✔

\# In a group consisting of equal no. of men & women. 10% of the men and 45% of the women are unemployed. If a person is selected randomly from the group then find the probability that the person is an employ.

Sol:-

Let E be the event of person of the employ

U be the " " " " Unemploy

Given $P(M) = \frac{1}{2}$, $P(W) = \frac{1}{2}$

$P(U|M) = 10\% = \frac{10}{100}$

$\Rightarrow P(E|M) = 1 - P(U|M) = \frac{90}{100}$

$P(U|W) = 45\% = \frac{45}{100}$

$\Rightarrow P(E|W) = 1 - P(U|W) = \frac{55}{100}$

$P(E) = P(M) \cdot P(E|M) + P(W) \cdot P(E|W)$

$\qquad = \frac{1}{2} \times \frac{90}{100} + \frac{1}{2} \frac{55}{100}$

$\qquad = \frac{1}{2} \left[\frac{145}{100} \right]$

$\qquad = \frac{1}{2} \left[\frac{29}{20} \right] = \frac{29}{40} = 0.725$

$=\!\!\times\!\!=$