WEEK 15
(LAYOUT OF LECTURE 29)

o Bayes Theorem

o Probability Questions

BAYE'S THEOREM

In probability theory and statistics, Bayes' theorem describes the probability of an event, based on prior knowledge of conditions that might be related to the event.

For example, if the risk of developing health problems is known to increase with age, Bayes's theorem allows the risk to an individual of a known age to be assessed more accurately than simply assuming that the individual is typical of the population as a whole.

STATEMENT OF BAYE'S THEOREM

STATEMENT: If the event $A_1, A_2, \ldots, A_k$ from a partition of a sample space S, that is , the events A_i are mutually exclusive and their union is S, and if B is any other event of S such that it can occur only if one of the A_i occurs, then for any i,

$$P\left(\frac{A_i}{B}\right) = \frac{P(A_i)P\left(\frac{B}{A_i}\right)}{\sum_{i=1}^{k} P(A_i)P\left(\frac{B}{A_i}\right)}, \text{for } i = 1,2, \ldots, k$$

APPLICATION OF BAYE'S THEOREM

In probability theory and statistics, Bayes' theorem describes the probability of an event, based on prior knowledge of conditions that might be related to the event.

For example, if the risk of developing health problems is known to increase with age, Bayes's theorem allows the risk to an individual of a known age to be assessed more accurately than simply assuming that the individual is typical of the population as a whole.

Dependent Event

Example: There are 6 black pens and 8 blue pens in a jar. If you take a pen without looking and then take another pen without replacing the first, what is the probability that you will get 2 black pens?

P(black first) = $\dfrac{6}{14}$ or $\dfrac{3}{7}$

P(black second) = $\dfrac{5}{13}$ (There are 13 pens left and 5 are black)

THEREFORE………………………………………………

P(black, black) = $\dfrac{3}{7} \bullet \dfrac{5}{13}$ or $\dfrac{15}{91}$