

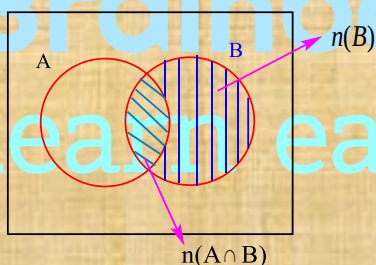
Chapter 13

PROBABILITY

CONDITIONAL PROBABILITY:

Conditional probability is a measure of the probability of an event (some particular situation occurring) given that (by assumption, presumption, assertion or evidence) another event has occurred. If the event of interest is 'A' and the event 'B' is known or assumed to have occurred, "the conditional probability of 'A' given B", or "the probability of A under the condition B", is usually written as $P(A/B)$

or $P\left(\frac{A}{B}\right)$.



$$\text{Thus, } P\left(\frac{A}{B}\right) = \frac{n(A \cap B)}{n(B)} = \frac{\frac{n(A \cap B)}{n(S)}}{\frac{n(B)}{n(S)}} = \frac{P(A \cap B)}{P(B)}.$$

NOTE:

If A and B are events of a sample space S of an experiment, then

$$(i) \quad P(S/A) = P(A/A) = 1$$

(ii) If $P(C) \neq 0$, then

$$P\left(\frac{A \cup B}{C}\right) = P(A/C) + P(B/C) - P(A \cap B/C)$$

(iii) $P\left(\frac{A^1}{B}\right) = 1 - P\left(\frac{A}{B}\right)$, if $P(B) \neq 0$.

Example:

Two dice are thrown, what is the probability that the sum of the numbers appearing on the two dices is 11, if 5 appears on the first?

Solution:

Let event B is “5 appears on the first dice”.

$$\therefore B = \{(5,1), (5,2), (5,3), (5,4), (5,5), (5,6)\}; n(B) = 6$$

Also, let event A is “Sum of the numbers appearing is 11”.

$$\therefore A = \{(5,6), (6,5)\}$$

$$\therefore A \cap B = \{(5,6)\}$$

$$\therefore P\left(\frac{A}{B}\right) = \frac{P(A \cap B)}{P(B)} = \frac{n(A \cap B)}{n(B)} = \frac{1}{6}.$$