

Chapter 13

PROBABILITY

INDEPENDENT EVENTS:

Two or more events are said to be independent if occurrence or non-occurrence of any of them does not affect the probability of occurrence or non-occurrence of other events.

Example:

When two dice are thrown then probability of getting an odd number from 1st die and even number from 2nd die is independent from each other.

Properties of Independent Events:

Consider two independent events A and B.

- A and B^c are independent events.
- A^c and B are independent events.
- A^c and B^c are independent events.
- For two independent events: $P(A \cap B) = P(A) \times P(B)$
- $P(A \cup B) = P(A) + P(B) - P(A).P(B) = 1 - P(A^c)P(B^c)$.

Example:

A speaks truth 75% of the cases and B is 80% cases. What is the probability that their statements about an incident do not match.

Solution:

Let A be the event that A speaks truth and B be the event that B speaks truth. Then $P(A) = \frac{75}{100} = \frac{3}{4}$, $P(\bar{A}) = 1 - P(A)$

$$= 1 - \frac{3}{4} = \frac{1}{4}, \quad P(B) = \frac{80}{100} = \frac{4}{5}, \quad P(\bar{B}) = 1 - P(B) = 1 - \frac{4}{5} = \frac{1}{5}$$

and A, B are independent, $\bar{A}, \bar{B}$ are also Independent.

The probability that their statements do not match.

i.e., They will be contradicting each other only when one speaks truth and other speaks false.

$$P(E) = P(A \cap \bar{B}) + P(\bar{A} \cap B) [\because \bar{A}, \bar{B} \text{ are also Independent}]$$

$$= P(A).P(\bar{B}) + P(\bar{A}).P(B)$$

$$= \frac{3}{4} \times \frac{1}{5} + \frac{1}{4} \times \frac{4}{5}$$

$$= \frac{3}{20} + \frac{4}{20}$$

$$= \frac{7}{20}$$

