

Chapter 13

PROBABILITY

Equally Likely(Events):

Cases (outcomes) are said to be equally likely when we have no reason to believe that one is more likely to occur than the other.

Example:

When an unbiased coin is tossed, occurrence of head and tail are equally likely cases.

Exhaustive cases(Events):

Consider the experiment of throwing a die. We have $S = \{1, 2, 3, 4, 5, 6\}$.

Let us define the following events:

A : 'A number less than 4 appears'.

B : 'A number greater than 2 but less than 5 appears'.

C : 'A number greater than 4 appears'.

Then, $A = \{1, 2, 3\}$, $B = \{3, 4\}$ and $C = \{5, 6\}$

So, $A \cup B \cup C = \{1, 2, 3\} \cup \{3, 4\} \cup \{5, 6\} = S$

Such events A, B and C are called exhaustive events.

In general, if $E_1, E_2, \dots, E_n$ are n events of a sample space

S and if $S = E_1 \cup E_2 \cup \dots \cup E_n = \bigcup_{i=1}^n E_i$,

Then $E_1, E_2, \dots, E_n$ are called exhaustive events.

Mutually Exclusive(Events):

In general, two events A and B are called mutually exclusive events if the occurrence of anyone of them excludes the occurrence of the other event i.e., it they cannot occur simultaneously.

A set of events $A_1, A_2, \dots, A_n$ is said to be mutually exclusive and exhaustive if

1) $A_i \cap A_j = \phi$ for $i \neq j$ and $1 \leq i, j \leq n$

2) $A_1 \cup A_2 \cup \dots \cup A_n = S$

Example:

In the experiment of rolling a die, the sample space is given by $S = \{1, 2, 3, 4, 5, 6\}$.

Consider events, A 'an odd number appears' and B 'an even number appears'.

Here, $A = \{1, 3, 5\}$ and $B = \{2, 4, 6\}$, clearly the event A excludes the event B and vice-versa.