Definitions of Various Terms.

(1) **Sample space:**The set of all possible outcomes of a trial (random experiment) is called its sample space. It is generally denoted by S and each outcome of the trial is said to be a sample point.

Example: (i) If a dice is thrown once, then its sample space is S = {1, 2, 3, 4, 5, 6}
(ii) If two coins are tossed together then its sample space is S = {HT, TH, HH, TT}.

(2) **Event:**An event is a subset of a sample space.

(i) **Simple event:**An event containing only a single sample point is called an elementary or simple event.
Example: In a single toss of coin, the event of getting a head is a simple event.
Here S = {H, T} and E = {H}

(ii) **Compound events:**Events obtained by combining together two or more elementary events are known as the compound events or decomposable events.
For example, In a single throw of a pair of dice the event of getting a doublet, is a compound event because this event occurs if any one of the elementary events (1, 1), (2, 2), (3, 3), (4, 4), (5, 5), (6, 6) occurs.

(iii) **Equally likely events:**Events are equally likely if there is no reason for an event to occur in preference to any other event.
Example: If an unbiased die is rolled, then each outcome is equally likely to happen i.e., all elementary events are equally likely.

(iv) **Mutually exclusive or disjoint events:**Events are said to be mutually exclusive or disjoint or incompatible if the occurrence of any one of them prevents the occurrence of all the others.

Example: E = getting an even number, F = getting an odd number, these two events are mutually exclusive, because, if E occurs we say that the number obtained is even and so it cannot be odd i.e., F does not occur.

A_1 and A_2 are mutually exclusive events if $A_1 \cap A_2 = \phi$.

(v) **Mutually non-exclusive events:**The events which are not mutually exclusive are known as compatible events or mutually nonexclusive events.

(vi) **Independentevents:**Events are said to be independent if the happening (or non-happening) of one event is not affected by the happening (or non-happening) of others.

Example: If two dice are thrown together, then getting an even number on first is independent to getting an odd number on the second.

(vii) **Dependent events:**Two or more events are said to be dependent if the happening of one event affects (partially or totally) other event.

Example: Suppose a bag contains 5 white and 4 black balls. Two balls are drawn one by one. Then two events that the first ball is white and second ball is black are independent if the first ball is replaced before drawing the second ball. If the first ball is not replaced then these two events will be dependent because second draw will have only 8 exhaustive cases.

(3) **Exhaustive number of cases:**The total number of possible outcomes of a random experiment in a trial is known as the exhaustive number of cases.

Example : In throwing a die the exhaustive number of cases is 6, since any one of the six faces marked with 1, 2, 3, 4, 5, 6 may come uppermost.

(4) **Favourable number of cases:**The number of cases favourable to an event in a trial is the total number of elementary events such that the occurrence of any one of them ensures the happening of the event.

Example : In drawing two cards from a pack of 52 cards, the number of cases favourable to drawing 2 queens is ${}^4C_2$.

(5) **Mutually exclusive and exhaustive system of events:**Let S be the sample space associated with a random experiment. Let A_1, A_2, ...A_n be subsets of S such that

(i) $A_i \cap A_j = \phi$ fori≠ j and (ii) $A_1 \cup A_2 \cup .... \cup A_n = S$

Then the collection of events $A_1, A_2, ..., A_n$ is said to form a mutually exclusive and exhaustive system of events.

If $E_1, E_2, \ldots\ldots, E_n$ are elementary events associated with a random experiment, then

(i) $E_i \cap E_j = \phi$ for $i \neq j$ and (ii) $E_1 \cup E_2 \cup \ldots\ldots \cup E_n = S$

So, the collection of elementary events associated with a random experiment always form a system of mutually exclusive and exhaustive system of events.

In this system, $P(A_1 \cup A_2 \ldots\ldots \cup A_n) = P(A_1) + P(A_2) + \ldots\ldots + P(A_n) = 1$.

Important Tips

- ☞ Independent events are always taken from different experiments, while mutually exclusive events are taken from a single experiment.
- ☞ Independent events can happen together while mutually exclusive events cannot happen together.
- ☞ Independent events are connected by the word "and" but mutually exclusive events are connected by the word "or".