Probability Important Notes and Formulas related to Event:

Probability of an Event

In a random experiment, let S be the sample space and $E \subseteq S$. Then if E is an event, the probability of occurrence of E is defined as

$$P(E) = \frac{\text{Number of outcomes favourable to occurence of } E}{\text{Number of all possible outcomes}} = \frac{n(E)}{n(S)}$$

This way of defining the probability is applicable only to finite sample spaces. So in this chapter, we will be dealing problems only with finite sample spaces.

- $P(E) = \frac{n(E)}{n(S)}$
- $P(S) = \frac{n(S)}{n(S)} = 1$. The probability of sure event is 1.
- $P(\phi) = \frac{n(\phi)}{n(s)} = \frac{0}{n(s)} = 0$. The probability of impossible event is 0.
- Since E is a subset of S and ϕ is a subset of any set,

  $$\phi \subseteq E \subseteq S$$
  $$P(\phi) \leq P(E) \leq P(S)$$
  $$0 \leq P(E) \leq 1$$

  Therefore, the probability value always lies from 0 to 1.
- The complement event of E is $\bar{E}$.

  Let $P(E) = \frac{m}{n}$ (where m is the number of favourable outcomes of E and n is the total number of possible outcomes).

  $$P(\bar{E}) = \frac{\text{Number of outcomes unfavourable to occurance of } E}{\text{Number of all possible outcomes}}$$
  $$P(\bar{E}) = \frac{n-m}{n} = 1 - \frac{m}{n}$$
  $$P(\bar{E}) = 1 - P(E)$$
- $P(E) + P(\bar{E}) = 1$'