Unit 11: Sample space, event and probability of an event

11.1 Set notation

The concept of element and set should be introduced. Use of upper case letters for sets and use of brackets {...} to list a set should also be mentioned. The meaning of universal set, empty set, subset, may be introduced through examples. The union, intersection and complement of sets may be introduced through Venn diagrams. Finite sets, infinite sets and the notation $n(A)$ should be mentioned. Detailed treatment of set language is not expected.

11.2 Sample space, event and probability

The use of set notation to denote sample space, event and probability should be mentioned. The concept of a sample space, S, as the set of all possible outcomes of an experiment, an event, E, as a subset of a sample space should be introduced. The concept of finite and infinite sample spaces should be introduced through examples. For example, (i) finite sample space: tossing a coin S = {Head, Tail} ; (ii) infinite sample space: (a) the number of telephone calls received in a certain time interval $S = \{0, 1, 2, 3, \ldots\}$; (b) the life-time ($t$ hours) of a randomly selected light-bulb $S = \{t : \ t \geq 0\}$.

For a finite sample space S, the probability of an event E is defined as $P(E) = \dfrac{n(E)}{n(S)}$.

Students should be reminded that in the above definition, all the elements in S should be equally likely to happen. For a more general definition, $P(E)$ is the sum of the probabilities associated with every element belonging to the subset E. Various examples should be discussed to illustrate the above point.

11.3 Mutually exclusive, exhaustive and complementary events

Two events are said to be mutually exclusive when their intersection is empty. The meaning of the above definition should be illustrated by examples. A set of events E_1, E_2, ... are said to be mutually exclusive and exhaustive if every element in the sample space belongs to one and only one event among E_1, E_2, ... Hence two events are complementary if and only if they are mutually exclusive and exhaustive. The above relationships among events may be pictured by means of Venn diagrams.

11.4 Further examples

Various techniques of finding the probability of an event should be introduced here through examples. Techniques such as tabulation of a finite sample space and tree diagram should be discussed. Students should also be able to apply the counting techniques such as permutation and combination in calculating the number of elements in events and the sample space and hence the probabilities.