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| **Unit I** |
| **Probability**  Consider an experiment whose outcome is not predictable with certainty. However, although the outcome of the experiment will not be known in advance, let us suppose that the set of all possible outcomes is known. This set of all possible outcomes of an experiment is known as the **SAMPLE SPACE** of the experiment and it is denoted by S.  Example: If the experiment consists of flipping two coins, then the sample space consists of the following four points S = {HH, HT, TH, TT }  Each outcome in a sample space is called a Sample Point Number of sample points in a sample space S is **n(S) = nk** Where n = number of outcomes and k = number of objects  **Probability:**  If an experiment results in ‘n’ exhaustive, mutually exclusive and equally likely cases and ‘m’ of them are favorable to the happening of an event ‘A’ then Probability of happening of A is    Since the number of cases in which the event A will not happen is ‘n – m’, the probability that event A will not happen is:    Therefore  **Axioms of probability:**  Consider an experiment whose sample space is S. For each event E of the sample space S, then       **Laws of probability:**   1. Addition theorem:     If A and B are exclusive events i.e. disjoint sets, then:   1. Addition theorem (for three events):If A, B and C are pairwise exclusive events     Complementary Event**:** |
| **Conditional Probability and Independence**  If A and B are two events in a sample space S, then the probability of the event B when the event A has already occurred is called the conditional probability of B and is denoted by P(A|B) and defined as    The probability P(A|B) is an updating of P(A) based on the knowledge that event B has already occurred.  **Multiplication law of probability:**  **Independent events:**  A set of events is said to be independent if the occurrence of any one of them does not depend on the occurrence or non-occurrence of the others. If two events A and B are independent then:    **Theorem of total probability:**  If B­1, B2,……Bn be a set of exhaustive and mutually exclusive events and A is another event associated with Bi, then    **Baye’s theorem:**  If E1, E2, E3, . . . En are mutually exclusive and exhaustive events with P(Ei) ≠ 0 for i = 1 to n of a RANDOM experiment then for any arbitrary event ‘A’ of the sample spaces of the above experiment with P(A) > 0 , we have i=1 |