

CLASS X

SUBJECT: MATHEMATICS

TOPIC	PROBABILITY
PREREQUISITE KNOWLEDGE	Probability- An Experiment Approach: Class IX
OBJECTIVES	The students will be able to: • Calculate the probability of an Event, total outcomes of the Experiments, Elementary Event, Complement of an Event, Sure Event and Impossible Event.
THE HISTORY OF PROBABILITY	"A gambler's dispute in 1654 led to the creation of a mathematical theory of probability by two famous French mathematicians, Blaise Pascal and Pierre de Fermat. Antoine Gombaud, Chevalier de Méré, a French nobleman with an interest in gaming and gambling questions, called Pascal's attention to an apparent contradiction concerning a popular dice game. The game consisted of throwing a pair of dice 24 times; the problem was to decide whether or not to bet even money on the occurrence of at least one "double six" during the 24 throws. A seemingly well-established gambling rule led de Méré to believe that betting on a double six in 24 throws would be profitable, but his own calculations indicated just the opposite. This problem and others posed by de Méré led to an exchange of letters between Pascal and Fermat in which the fundamental principles of probability theory were formulated for the first time. Although a few special problems on games of chance had been solved by some Italian mathematicians in the 15th and 16th centuries, no general theory was developed before this famous correspondence. The Dutch scientist Christian Huygens, a teacher of Leibniz, learned of this correspondence and shortly thereafter (in 1657) published the first book on probability; entitled <i>De Ratiociniis in Ludo Aleae</i>, it was a treatise on problems associated with gambling. Because of the inherent appeal of games of chance, probability theory soon became popular, and the subject developed rapidly during the 18th century. The major contributors during this period were Jakob Bernoulli (1654-1705) and Abraham de Moivre (1667-1754). In 1812 Pierre de Laplace (1749-1827) introduced a host of new ideas and mathematical techniques in his book, <i>Théorie Analytique des Probabilités</i>. Before Laplace, probability theory was solely concerned with developing a mathematical analysis of games of chance. Laplace applied probabilistic ideas to many scientific and practical problems. The theory of errors, actuarial mathematics, and statistical mechanics are examples of some of the important applications of probability theory developed in the 19th century.

SUMMARY OF THE CHAPTER	In this chapter students will study: 1) the difference between experimental probability and theoretical probability. 2) the theoretical (classical) probability of an event E, written as $P(E)$, is defined as $P(E) = \text{Number of outcomes favorable to E} / \text{Number of all possible outcomes of the experiment}$ where we assume that the outcomes of the experiment are equally likely. 3) the probability of a sure event (or certain event) is 1. 4) the probability of an impossible event is 0. An event having only one outcome is called an elementary event. The sum of the probabilities of all the elementary events of an experiment is 1. For any event E, $P(E) + P(\bar{E}) = 1$, where $\bar{E}$ stands for 'not E'. E and $\bar{E}$ are called complementary events.
TRANSACTION METHODOLOGY	Strategies used: 1) Warm up session: Begin the session by recalling the concepts learnt by students in the previous class. Ask questions regarding terms, such as Experiment, Trial, Event and Outcome. Give some questions where the students have to calculate the Probability of an Event. 2) Explain the concept of Theoretical Probability. It is the ratio between the number of ways in which an event can occur and the total number of possible outcomes in the Sample Space. 3) Experiment: In this activity students will perform an experiment to understand the difference between experimental probability and theoretical probability. Divide the class into a few groups and ask them to perform an experiment as follows: Give three coins to each group and ask them to find the experimental probability of getting at least two heads. The students should record the outcomes of their experiment in a sheet. Then ask the students to check the outcomes of the experiment using theoretical probability. Guide the students in the right direction by asking them about the possible outcomes. Once the activity is done, discuss the difference between the experimental and theoretical probability. 4) Presentation: In this activity, students will perform experiments and explain various concepts, such as Equally Likely Outcomes, Elementary Event, Complement of an Event, Sure Event and Impossible Event. Divide the class into three groups. The groups have to use different examples to explain the concepts. They can use charts or show experiments in the class. After the presentation, give the students word problems pertaining to the concepts of probability. 5) Supplemental Activities:

	Ask the students to perform the following activity: • Select 40 students of different age groups and survey about the different diseases they have faced in a given year. Then present the findings in a tabular form and calculate the probability of the most common diseases for the children of different age groups. • Find out about the role of probability in cricket match. For example, the toss of a coin between the captains to decide which team would bat/ball first. • Find out how probability is used in various occupations, such as health care insurance, advertising, farming and weather forecasting. Share the findings with the class.
EXPECTED LEARNING OUTCOMES	Students will be able to: • understand the concept of Theoretical Probability. • explain various terms, such as Equally Likely Outcomes, Elementary Events, Complement of an Event, Sure Event and Impossible Event. • solve questions based on theoretical Probability.
PRACTICE QUESTIONS/ ASSESSMENTS	1. A bag contains 9 black and 12 white balls. One ball is drawn at random. What is the probability that the ball drawn is black? 2. Find the probability that a number selected from the numbers 1 to 25 which is not a prime number when each of the given number is equally likely to be selected. 3. A bag contains 10 red, 5 blue and 7 green balls. A ball is drawn at random. Find the probability of this ball being not a blue ball. 4. Two dice are thrown at the same time and the product of numbers appearing on them is noted. Find the probability that the product is less than 9. 5. Cards, marked with numbers 5 to 50, are placed in a box and mixed thoroughly. A card is drawn from the box at random. Find the probability that the number on the taken-out card is: (i) a prime number less than 10. (ii) a number which is a perfect square. 6. Two dice are thrown simultaneously. What is the probability that (i) 5 will not come up on either of them? (ii) 5 will come up on at least one? (iii) 5 will come up at both dice? 7. From a well shuffled pack of playing cards, black jacks, black kings and black aces are removed. A card is then drawn from the pack. Find the probability of getting. (i) a red card (ii) not a diamond card. 8. A bag contains cards which are numbered from 2 to 90. A card is drawn at random from the bag. Find the probability that it bears. (i) a two-digit number (ii) a number which is a perfect square. 9. Cards numbered 1 to 30 are put in a bag. A card is drawn at random from this bag. Find the probability that the number on the drawn card is:

	(i) not divisible by 3. (ii) a prime number greater than 7. (iii) not a perfect square number. 10. Two different dice are tossed together. Find the probability: (i) That the numbers on either dice is even. (ii) That the sum of numbers appearing on the two dice is 5.
EVALUATION	1) Textual learning and understanding assessed through Pen Paper Test. 2) Assignment project to demonstrate the learning and clarity of topics. 3) Classroom connection to be assessed through oral questionnaire. 4) Peer coordination and collaboration to be assessed through Lab Manual Activities and Quiz.