TOPIC: PROBABILITY

1.In a game , a man wins rupees five for a six and loses rupee one for any other number, when a fair die is thrown. The man decided to throw but to quit as and when he gets a six. Find the expected value of the amount he wins / loses.

2. In a hockey match, both team A and B scored same number of goals upto the end of the game, so to decide the winner, the referee asked both the captains to throw a die alternately and decided that the team, whose captain gets a six first, will be declared the winner. If the captain of team A was asked to start, then find their respective probabilities of winning the match and state whether the decision of the referee was fair or not.

3.Probability of solving a specific problem independently by A and B are ½ and 1/3, respectively. If both try to solve problem independently, then find the probability that

   (i)   Problem is solved.
   (ii)   Exactly one of them solves the problem.

4. A speak youth in 75% of cases, while N in 90% of the cases. In what percent of cases are they likely to contradict each other in stating the same fact? Do you think that statement of B is true?

5.P speaks truth in 70% of the cases and Q in 80% of the cases, In what percent of cases are they likely to agree in stating the same fact? Do you think, when they agree, means both are speaking truth?

6.A speak truth in 60% of the cases, while B in 90% of the cases in what per cent of cases are they likely to contradict each other in stating the same fact? In the cases of contradiction do you think, the statement of B will carry more weight as the speaks truth in more number of cases than A?

7.The probabilities of two students A and B coming to the school in time are 3/7 and 5/7, respectively . Assuming that the events, 'A coming in time' and B coming

in time' are independent, find the probability of only one of them coming to the school in time. Write atleast one advantage of coming to school in time.

8. 12 cards numbered 1 to 12 are placed in a box, mixed up thoroughly and then a card is drawn at random from the box. If it is known that the number on the drawn card is more than 3, then find the probability that it is an even number.

9.Consider the experiment of tossing a coin. If the coin shows head, toss it again, but if it shows tail, then throw a die. Find the conditional probability of the event that 'the die shows a number greater that 4', given that' there is at least one tail.

10. A couple has 2 children. Find the probability that both are boys, if it is known that

(i) One of them is a boy
(ii) The older child is a boy.

11.Assume that each born child is equally likely to be a boy or girl. If a family has two children , then what is the conditional probability that both are girls? Given that

(i)   The youngest is a girl?
(ii)   Atleast one is a girl?

12. A doctor is to visit a patient. From the past experience, it is known that the probabilities of doctor coming by train, bus , scooter and taxi are $\frac{1}{10}, \frac{1}{5}, \frac{3}{10} \ and \frac{2}{5}$, respectively. The probabilities that he will be late are $\frac{1}{4}, \frac{1}{3} \ and \frac{1}{12}$, if he comes by train, bus and scooter respectively but by taxi, he will not be late. When he arrives he is late; what is the probability that he came by bus?

13.In a bulb factor, machine A, B and C manufacture 60%, 30% and 10% bulbs, respectively. 1%, 2% and 3% of bulbs produced respectively by A, B and C are

found to be defective. A bulb is picked up at random from total production and found to be defective. Find the probability that this bulb was produced by machine A.

14. There are three coins. One is a two headed coin (having head on both faces), other is a biased coin that comes up heads 75% of the times and third is an unbiased coin. One of the three coins is chosen at random and tossed and it shows head. What is the probability that it was two headed coin?

15. There are three identical boxes I, II and III, each containing two coins. In box I, both coins are gold coins, in box II, both are silver coins and in box III, there is one gold and one silver coin. A person chooses a box at random and take out a coin. If the coin is of gold, then what is the probability that the other coin in box is also of gold?

16. There are three coins. One is a two tailed coin (having tail on both faces), another is biased coin that comes up heads 60% of the times and third is an unbiased coin. One of the three coins is chosen at random and tossed and it shows tail. What is the probability that it is a two tailed coin?

17. In a class , 5% of boys and 10% of girls have an IQ of more than 150. In the class, 60% are boys and rest are girls. If student is selected at random and found to have an IQ of more than 150, then find the probability that the student is a boy.

18. An insurance company insured 2000 scooter drivers, 4000 car drivers and 6000 truck drivers. The probabilities of an accident for them are 0.01, 0.03 and 0.15 respectively. One of the insured persons meets with an accident. What is the probability that he is a scooter driver or a car driver?

19. A man is known to speak the truth 3 out of 5 times. He throws a die and reports that it is '1'. Find the probability that it is actually 1.

20. From a lot of 15 bulbs which include 5 defectives, a sample of 4 bulbs is drawn one by one with replacement. Find the probability distribution of number of defective bulbs. Hence, find the mean of the distribution.

21.In a group of 400 people, 160 are smokers and non-vegetarian, 100 are smokers and vegetarian and the remaining are non-smokers and vegetarian. The probability of getting a special chest disease are 35%, 20$ and 10%, respectively. A person is chosen from the group at random and is found to be suffering from the disease. What is the probability that the selected person is a smoker and no-vege Bag I contains 3 red and 4 black balls and bag II contains 5 red and 6 black balls. One ball is drawn at random from one of the bags and is found to be red. Find the probability that it was drawn from bag II.

22.A man is thrown to speak truth 3 out of 4 times. He throws a die and reports that it is a six. Find the probability that it is actually a six.

23.A factory has two machines A and B. Past record shows that machine A produced 60% of items of output and machine B produced 40% of items. Further, 2% of items, produced by machine A and 1% produced by machine B were defective. All the items are put into a stockpile and then one item is chosen at random from this and item is found to be defective. What is the probability that it was produced by machine B?

24. Two groups are completing for the post of board of directors of a corporation. The probabilities that the first and second group wins are 0.6 and 0.4 , respectively. Further, if the first group wins, the probability of introducing a new product is 0.7 and the corresponding probability is 0.3, if the second group wins. Find the probability that the new product was introduced by second group.

25.Three bags contain ball as shown in the table.

Bag	White Balls	Black Balls	Red Balls
I	1	2	3
II	2	1	1
III	4	3	2

A bag is chosen at random and two balls are drawn from it. They happen to be white and red. What is the probability that they come from bag III?

26. A company has two plants to manufacture motorcycles. 70% motorcycles are manufactured at the first plant, while 30% are manufactured at the second plant,

At first plant, 80% motorcycles are rated of the standard quality, while at the second plant, 90% are rated of standard quality.A motorcycle, randomly picked up and is found to be standard quality. Find the probability that it has come out from the second plant.

27.Two cards are drawn simultaneously (or successively without replacement) from a well-shuffled deck of 52 cards. Find the mean, variance and standard deviation of number of aces.

28.A bag contains 4 red and 4 black balls, other bag contains 2 red and 6 black balls. One of the bag is selected at random and a ball is drawn from the bag which is found to be red. Find the probability that ball is drawn from first bag?

29.A man is known to speak truth 3 out of 5 times. He throws a die and reports that it is a number greater than 4. Fine the probability that it is actually a number greater than 4.

30.Colored balls are distributed in three bags as shown in the following table:

Bag	Colour of Balls		
	Black	**White**	**Red**
I	1	2	3
II	2	4	1
III	4	5	3

A bag is selected at random and then two balls are randomly drawn from selected bag. They happen to be black and red. What is the probability that they come from bag I?

31. In a bolt factory, machine A, B and C manufacture 25%, 35% and 40% of total production, respectively. Out of their total output , 5%, 4% and 2% are defective bolts. A bolt is drawn at random and is found to be defective. What is the probability that it is manufactured by machine B?

32.A card from a pack of 52 cards is lost. From the remaining cards of the pack, two cards are drawn at random and are found to both of clubs. Find the probability of the lost card being of clubs.

33.Among the student in a college, it is known that 60% reside in hostel and 40% are day scholars (not residing in hostel). Previous year results report that 30% of all students who reside in hostel attain A grade and 20% of day scholars attain A grade in their annual exams. At the end of year , one student is chosen at random from the college and he has an A grade , What is the probability that the student is a hostelier?

34.Suppose a girl a thrown a die. If she gets 5 or 6, then, she tosses a coin 3 times and note the number of heads. If she gets 1, 2, 3 or 4, she tosses a coin once and note whether a head or tail is obtained. If she obtained exactly one head, then what is the probability that she throw 1, 2, 3 or 4 with the die?

35.Suppose 5% of men and 0.25% of women have grey hair. A grey haired person is selected at random What is the probability of this person being male? Assume that there are equal number of males and females.

36.From a lot of 10 bulbs, which includes 3 defectives, a sample of 2 bulbs is drawn at random. Find the probability distribution of number of defective bulbs?

37An experiment succeeds thrice as often as it fails. Find the probability that in the next five trials, there will be atleast 3 successes.

38.Three cards are drawn at random (without replacement) from a well-shuffled pack of 52 playing cards. Find the probability distribution of number of red cards. Hence, find the mean of the distribution.

39.A class has 15 students whose ages are 14, 17, 15, 14, 21, 17, 19, 20, 16, 18, 20, 17, 16, 19 and 20 years. One student is selected in such a manner that each has the same chance of being chosen and the age X of the selected student is recorded What is the probability distribution of the random variable X? Find the mean Find the mean number of heads in three tosses of a coin.

40.A random variable X has following probability distribution:

X	0	1	2	3	4	5	6	7
P(X)	0	K	2k	2k	3k	K^2	$2k^2$	$7k^2+k$

Find (i) k (ii) P(X<3) (iii) P(X>6) (iv) P(0<X<3)

41.Find the probability distribution of number of doublets in three tosses of a pair dice.

42.Two cards are drawn successively with replacement from a well-shuffled deck of 52 cards. Find the probability distribution of number of aces.

43.Two cards are drawn simultaneously (without replacement) from a well-shuffled pack of 52 cards. Find the probability distribution of number of aces. Also, find the mean of distribution.

44.In a multiple choice examination with three possible answers (out of which only one is correct) for each of the five questions, what is the probability that a candidate would get four or more correct answers just by guessing?

45.A die is thrown again and again until three sixes are obtained. Find the probability of obtaining third six in the sixth throw of die.

46.Three cards are drawn successively with replacement from a well-shuffled deck of 52 cards. If getting a card of spade is a success, then find the probability distribution of number of success.

47.A pair of dice is thrown 4 times. If getting a doublet is a success, then find the probability distribution of number of success.

48.A card from a pack of 52 playing cards is lost. From the remaining card, of the pack, three cards are drawn at random (without replacement) and are found to be all spades. Find the probability of the four lost cards being a spade.

49.Two numbers are selected at random (without replacement) from the first six positive integers, Let X denotes the larger of the two numbers obtained. Find the probability distribution of the random variable X and hence, find the mean of the distribution.

50.A bag contains 3 red and 7 black balls. Two balls are selected at random one – by – one without replacement. If the second selected ball happens to be red, what is the probability that the first selected ball is also red?

51.Out of a group of 30 people , 20 always speak the truth . Two persons are selected at random form the group . Find the probability distribution of the number of selected persons who speak the truth . Also , find the mean of the distribution. What values are described in this question ?

52.Assume that the chances of a patient having a heart attack is 40%. Assuming that a meditation and yoga course reduces the risk of heart attack by 30% and prescription of certain drug reduces its chance by 25%. At a time , a patient can choose anyone of the two options with equal probabilities. It is given that after going through one of the two options, the patient selected at random sufferes a heart attack. Find the probability that the patient followed a course of meditation and yoga. Interpret the result and state which of the above stated methods, is more beneficial for the patient?

53.How many times must a man toss a fair coin, so that the probability of having atleast one head is more than 80%?

54.Two cards are drawn simultaneously (without replacement) from a well-shu There are three coins. One is a two headed coin (having head on both faces), another is a biased coin that comes up heads 75% of the times and third is also a biased coin that comes up tails 40% of the times, One of the three coins is chosen at random and tosses and it shows head. What is the probability that it was the two headed coin?

55.An urn contains 4 balls. Two balls are drawn at random from the urn (without replacement) and are found to be white. What is the probability that all the balls in the urn are white?

56.Five cards are drawn one by one, with replacement, from a well-shuffled deck of 52 cards. Find the probability that

    i) All the five cards are diamonds.
    ii) Only three cards are diamonds.
    iii) None is obtained.

57.from deck of 52 cards. Find the mean and variance of number of red cards.