2014 Foreign

1. Three cards are drawn at random (without replacement) from a well-shuffled pack of 52 playing cards. Find the probability distribution of the number of red cards. Hence, find the mean of the distribution.   [4 marks]

2. 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?   **OR**

3. 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 diamonds
   (ii) only 3 cards are diamonds
   (iii) none is a diamond   [6 marks]

2014 Delhi

4. Assume that each born child is equally likely to be a boy or a girl. If a family has two children, what is the conditional probability that both are girls? Give that
   (i) the youngest is a girl.
   (ii) at least one is a girl.   [4 marks]

5. A card from a pack of 52 playing cards is lost. From the remaining cards of the pack three cards are drawn at random (without replacement) and are found to be all spades. Find the probability of the lost card being a spade. **OR**   [6 marks]

6. 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.

2014 AI

7. An experiment succeeds thrice as often as it fails. Find the probability that in the next five trials, there will be at least 3 successes.   [4 marks]

8. 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 the third is also a biased coin that comes up tails 40% of the time. One of the three coins is chosen at random and tossed and it shows heads. What is the probability that it was the two-headed coin? **OR**

9. Two numbers are selected at random (without replacement) from the first six positive integers. Let X denote the larger of the two numbers obtained. Find the probability distribution of the random variable X and hence, find the mean of the distribution.   [6 marks]

2013 Foreign

10. In a group of 50 scouts in a camp, 30 are well trained in first aid techniques while the remaining are well trained in hospitality but not first aid. Two scouts are selected at random from the group. Find the probability distribution of number of selected scouts who are well trained in first aid. Find the mean of the distribution also. Write one more value which is expected from a well trained scout.   [4 marks]

11. Often it is taken that a truthful man commands more respect in the society. A man is known to speak the truth 4 out of 5 times. He throws a die and reports that it is actually a six. Find the probability that it is actually a six. Do you also agree that the value truthfulness leads to more respect in the society?   [6 marks]

2013 Delhi

12. A speaks truth in 60% of the cases, while B in 90% of the cases. In what percent 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 he speaks truth in more number of cases than A?   [4 marks]

13. 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 any one of the two options with equal probabilities. It is given that after going through one of the two options, the patient selected at random suffers 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. [6 marks]

2013 AI

14. The probabilities of two students A and B coming to the school in time are $\frac{3}{7}$ and $\frac{5}{7}$ 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 at least one advantage of coming to school in time. [4 marks]

15. In a hockey match, both teams A and B scored same number of goals up to 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, find their respective probabilities of winning the match and state whether the decision of the referee was fair or not.
[6 marks]

2013 compartment

16. Out of a group of 30 honest people, 20 always speak the truth. Two persons are selected at random from 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? [4 marks]

17. In a group of 25 scientists, 15 are keen observers and do not commit errors in dealing with data whereas others, while they are hard working, shirk working with data. Two scientists are selected from the group at random. Find the probability distributions of the number of scientists who are keen observers and do not commit error dealing with data. Also find the mean of the distribution. What value has been depicted in this question?

18. 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 probabilities 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 the selected person is a smoker and non – vegetarian? What value is reflected in this question?

19. 75% students of a college reside in hostel and the remaining reside outside. There is a strict discipline in the hostel and fixed time for studies and other curricular activities, while college has no control on activities of students residing outside hostel. Last year results showed that 50% hostellers got A grade while 25% other students got A grade. At the end of the year , a student was selected at random and got A grade in the examination. What is the probability that the selected student was a hosteller? Which value is reflected in this question?

2012 Foreign

20. A pair of dice is thrown 4 times. If getting a doublet is considered a success, find the probability distribution of the number of successes and hence find its mean. [4 marks]

21. In a certain college , 4% of the boys and 1% of the girls are taller than 1.75 metres. Furthermore, 60% of the students in the college are girls. a student is selected at random from the college and is found to be taller than 1.75 metres. Find the probability that the selected student is a girl. [6 marks]

2012 Delhi

22. How many times must a man toss a fair coin so that the probability of having at least one head is more than 80%? [4 marks]

23. (set)Bag I contains 3 red and 4 black balls and bag II contains 4 red and 5 black balls. One ball is transferred from bag I to bag II and then a ball is drawn from bag II at random. The ball so drawn is found to be red in colour. Find the probability that the transferred ball is black. [6 marks]

24. (set) Suppose a girl throws a die. If she gets a 5 or 6, she tosses a coin three times and notes the number of heads. If she gets 1, 2, 3, or 4 she tosses a coin once and notes whether a head or tail is obtained. If she obtained exactly one head, what is the probability that she threw 1, 2, 3, or 4 with the die? [6 marks]

25. (set) Of the students in a college, it is known that 60% reside in hostel and 40% are day scholars. 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 examination. At the end of the 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 hostlier? [6 marks]

26. Two cards are drawn simultaneously (without replacement) from a well shuffled pack of 52 cards. Find the mean and variance of the number of red cards. [4 marks]

27. Suppose a girl throws a die. If she gets a 5 or 6, she tosses a coin three times and notes the number of heads. If she gets 1, 2, 3, or 4 she tosses a coin once and notes whether a head or tail is obtained. If she obtained exactly one head, what is the probability that she threw 1, 2, 3, or 4 with the die? [6 marks]

28. An urn contains 4 white and 6 red balls. Four balls are drawn at random (without replacement) from the urn. Find the probability distribution of the number of white balls. [4 marks]

29. 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 be hearts. Find the probability of the missing card to be a heart. [6 marks]

30. Find the mean number of heads in three tosses of a fair coin. [4 marks]

31. (Set 1) A factory has two machines A and B. Past record shows that machine A produced 60% items of the output and machine B produced 40% of items. Further 2% of the items produced by machine A and 1% produced by machine B were found defective All items are put into one stockpile and then one item is chosen at random from this and is found defective. What is the probability that it was produced by machine B? [6 marks]

32. (Set 2) Bag I contains 3 red and 4 black balls and bag II contains 4 red and 5 black balls. One ball is transferred from bag I to bag II and then a ball is drawn from bag II at random. The ball so drawn is found to be red in colour. Find the probability that the transferred ball is black. [6 marks]

33. (Set 3) 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 the third is an unbiased coin. One of the three coins is chosen at random and tossed, it shows head. What is the probability that it was the two headed coin?

[6 marks]

34. Probabilities of solving a specific problem independently by A and B are 1/2 and 1/3 respectively. If both try to solve the problem independently, find the probability that (i) the problem is solved (ii) exactly one of them solves the problem. [4 marks]

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. [6 marks]

36. Given 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 takes out a coin. If the coin is of gold, what is the probability that the other coin in the box is also of gold? [6 marks]

37. A man is known to speak the 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. [6 marks]

A random variable X has the following probability distribution :

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

Determine :

38. (i) k   (ii) P(X < 3)   (iii) P(X > 6)   (iv) P(0 < X <3).   **[2011 AI**

39. OR Find the probability of throwing at most two sixes in six throws of a single die.   [4 marks]

40. Given 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 takes out a coin. If the coin is of gold, what is the probability that the other coin in the box is also of gold? [6 marks]

2010 Foreign

41. An experiment succeeds twice as often it fails. Find the probability that in the next six trials, there will be at least 4 successes. [4 marks]
42. An urn contains 4 white and 3 red balls. Let X denote the number of red balls in a random draw of three balls. Find the mean and variance of X. [4 marks]
43. OR In answering a question on a multiple choice test, a student either knows the answer or guesses. Let 3/5 be the probability that he knows the answer and 2/5 be the probability that he guesses. Assuming that a student who guesses at the answer will be correct with probability 1/3, what is the probability that the student knows the answer, given that he answered it correctly. [6 marks]

2010 Delhi

44. (Set 1 & 2) On 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? [4 marks]
45. (All Sets)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 clubs. Find the probability of the lost card being of clubs.
46. (All Sets) OR From a lot of 10 bulbs which includes 3 defectives, a sample of 2 bulbs is drawn at random. Find the probability distribution of the number of defective bulbs. [6 marks]
47. (Set 3) There are two bags, Bag *I* and Bag *II*. Bag *I* contains 4 white and 3 red balls while another Bag II contains 3 white and 7 red balls. One ball is drawn at random from one of the bags and it is found to be white. Find the probability that it was drawn from Bag *I*. [4 marks]

2010 AI

48. A family has 2 children. Find the probability that both the are boys, if it is known that i) at least one of the children is a boy. ii) the elder child is a boy. [4 marks]
49. A bag contains 4 balls. Two balls are drawn at random, and are found to be white. What is the probability that all balls are white? [6 marks]

2010 Compartment Exam

50. Two cards are drawn simultaneously (without replacement) from a well – shuffled pack of 52 cards. Find the probability distribution of the number of aces. Also find the mean of the distribution. [4 marks]
51. In a class, 5% of the boys and 10% of the girls have an IQ of more than 150. In the class 60% of the students are boys and rest girls. If a student is selected at random and found to have an IQ of more than 150, find the probability that the student is a boy. [6 marks]

2009 Foreign

52. The probability that A hits a target is 1/3 and the probability that B hit it is 2/5. If each one A and B shoots at the target ,What is the probability that a) the target is hit b)exactly one of them hits the target c)None hits the target(*part 'c' was not asked in the exam*)? [4 marks]
53. (Set 1) Two cards are drawn simultaneously (or successively without replacement)from a well shuffled pack of 52 cards. Find the mean and variance of the number of red cards. [6 marks]
54. (Set 2) A pair of dice is thrown 4 times . If getting a doublet is considered a success, find the mean and variance of the number of successes. [6 marks]
55. (Set 3) From a lot of 30 bulbs which includes 6 defectives, a sample of 4 bulbs is drawn at random with replacement. Find the mean and variance of the number of defective bulbs. [6 marks]

2009 Delhi

56. A die is thrown again and again until three sixes are obtained. Find the probability of obtaining the third six in the sixth throw of a die? [4 marks]
57. (Set 1) Three bags contain balls as shown in the table below:

Bag	Number of white balls	Number of black balls	Number of 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 red and white. What is the probability that they came from the III bag. [6 marks] [ans:5/17]

58. (Set 2) Two groups are competing for the position on the Board of Directors of a corporation. The probabilities that the first and the second groups will win 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 the second group. [6 marks]

59. (Set 3) There are three coins. One is a two headed coin(having head on both faces), another is a biased coin that comes up tails 25% of the times and the third is an unbiased coin. One of the three coins is chosen at random and tossed, it shows head. What is the probability that it was from the two headed coin? [6 marks]

2009 AI

60. On 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? [4 marks]

61. (Set 3) A man is known to speak the truth 3 out of 5 times. He throws a die and reports that it is a number greater than 4. Find the probability that it is actually a number greater than 4. [6 marks]

62. (Set 1) Coloured balls are distributed in three bags as shown in the table below:

Bag	Number of black balls	Number of white balls	Number of red balls
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 the selected bag. They happen to be black and red. What is the probability that they came from bag I? [6 marks]

60. (Set 2) Coloured balls are distributed in three bags as shown in the table below:

Bag	Number of black balls	Number of white balls	Number of red balls
I	2	1	3
II	4	2	1
III	5	4	3

A bag is selected at random and then two balls are randomly drawn from the selected bag. They happen to be white and red. What is the probability that they came from bag II? [6 marks]

2008 Foreign

61. Two cards are drawn simultaneously from a well shuffled pack of 52 cards. Find the mean and standard deviation of the number of kings. [4 marks] [ans: 2/13; 0.373]

62. In a factory which manufactures bolts, machines A, B and C manufactures respectively 25%, 35% and 40% of the bolts. Of their outputs, 5, 4 and 2 percent are respectively defective bolts. A bolt is drawn at random from the total production and is found to be defective. Find the probability that it is manufactured by the machine B. [6 marks]   [ans: 28/69]

2008 Delhi

63. A pair of dice is thrown 4 times. If getting a doublet is considered a success, find the probability distribution of the number of successes. [4 marks] [ans: 625/1296;500/1296;150/1296;20/1296;1/1296]

64. An insurance company insured 2000 scooter drivers, 4000 car drivers and 6000 truck drivers. The probabilities of an accident are respectively 0.01, 0.03 and 0.15 respectively. One of the insured person meets with an accident. What is the probability that he is a scooter driver? [6 marks]   [ans: 1/52]

2008 AI

65. 12 cards, numbered 1 to 12, are placed in a box, mixed up thoroughly and then a card is drawn random from the box. If it is known that the number on the drawn card is more than 3, find the probability that it is an even number. [4 marks]   [ans: 5/9]

66. In a bulb factory, machines A, B and C manufacture 60%, 30% and 10% bulbs respectively. 1%, 2% and 3% of the bulbs produced respectively by A, B and C are found to be defective. Find the probability that this bulb was produced by the machine A. [6 marks]   [ans: 2/5]