

**2008 Delhi**

1. 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:  $625/1296; 500/1296; 150/1296; 20/1296; 1/1296$ ]
2. 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**

3. 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:  $5/9$ ]
4. 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:  $2/5$ ]

**2008 Foreign**

5. 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:  $2/13; 0.373$ ]
6. 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:  $28/69$ ]

**2009 Delhi**

7. 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]
8. (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]

9. (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]
10. (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**

11. 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]
12. (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]

13. (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]

14. (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]

### 2009 Foreign

15. The probability that A hits a target is  $\frac{1}{3}$  and the probability that B hit it is  $\frac{2}{5}$ . 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]
16. (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]
17. (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]
18. (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]

### 2010 Delhi

19. (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]
20. (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.
21. (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]
22. (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

23. A family has 2 children. Find the probability that both 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]
24. 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]

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25. 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]
26. 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. [6 marks]
27. OR In answering a question on a multiple choice test, a student either knows the answer or guesses. Let  $\frac{3}{5}$  be the probability that he knows the answer and  $\frac{2}{5}$  be the probability that he guesses. Assuming that a student who guesses at the answer will be correct with probability  $\frac{1}{3}$ , what is the probability that the student knows the answer, given that he answered it correctly. [6 marks]

### 2010 Comptmnt

28. 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. [ 6 marks ]
29. 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 ]

### 2011 Delhi

30. Probabilities of solving a specific problem independently by A and B are  $\frac{1}{2}$  and  $\frac{1}{3}$  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 ]
31. 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 ]
32. 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 ]
33. 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 ]

### 2011 Foreign

34. Find the mean number of heads in three tosses of a fair coin. [ 4 marks ]
35. (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 ]
36. (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 ]
37. (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]