

**BAYE'S THEOREM**

1. In a bolt factory, machines A, B and C manufacture respectively 25%, 35% and 40% of the total bolts. Of their output 5, 4 and 2 percent are respectively defective bolts. A bolt is drawn at random from the product. If the bolt drawn is found to be defective, what is the probability that it is manufactured by the machine B ?  
**Ans. 28/69**
2. Three urns contain 6 red, 4 black, 4 red, 6 black and 5 red, 5 black balls respectively. One of the urns is selected at random and a ball is drawn from it. If the ball drawn is red, find the probability that it is drawn from the first urn.  
**Ans. 2/5**
3. A company has two plants to manufacture scooters. Plant I manufactures 70% of the scooters and Plant II manufactures 30%. At Plant I, 80% of the scooters are rated as of standard quality and at Plant II, 90% of the scooters are rated as of standard quality. A scooter is chosen at random and is found to be of standard quality. What is the probability that it has come from Plant II ?  
**Ans. 27/83**
4. An insurance company insured 2000 scooter drivers, 4000 car drivers and 6000 truck drivers. The probability of an accident involving a scooter driver, car driver and a truck is 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 ? **Ans. 1/52**
5. Urn A contains 2 white, 1 black and 3 red balls, urn B contains 3 white, 2 black and 4 red balls and urn C contains 4 white, 3 black and 2 red balls. One urn is chosen at random and 2 balls are drawn at random from the urn. If the chosen balls happen to be red and black, what is the probability that both balls come from urn B ?  
**Ans. 20/53**
6. There are 3 bags, each containing 5 white balls and 3 black balls. Also there are 2 bags each containing 2 white balls and 4 black balls. A white ball is drawn at random. Find the probability that this white ball is from a bag of the first group.  
**Ans. 45/61**
7. A man is known 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.  
**Ans. 3/8**
8. In a test, an examinee either guesses or knows the answer to a multiple choice question with four choices. The probability that he makes a guess is  $\frac{1}{3}$  and the probability that he copies the answer is  $\frac{1}{6}$ . The probability that his answer is correct, given that he copied it, is  $\frac{1}{8}$ . Find the probability that he knew the answer to the question, given that he correctly answered it.  
**Ans. 24/29**
9. A card from a pack of 52 cards is lost. From the remaining cards of the pack, two cards are drawn and are found to be hearts. Find the probability of the missing card to be a heart.  
**Ans. 11/50**
10. A letter is known to have come either from TATANAGAR or CALCUTTA. On the envelope just two consecutive letters TA are visible. What is the probability that the letter has come from (i) Calcutta (ii) Tatanagar ?  
**Ans. 7/11**
11. A doctor is to visit a patient. From the past experience, it is known that the probability that he will come by train, bus, scooter or by other means of transport are respectively  $\frac{3}{10}$ ,  $\frac{1}{5}$ ,  $\frac{1}{10}$  and  $\frac{2}{5}$ . The probability 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 if he comes by other means of transport, then he will not be late. When he arrives, he is late. What is the probability that he comes by train ?  
**Ans. 1/2**
12. 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 a 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 a 1, 2, 3 or 4 with the die ?  
**Ans. 8/11**

- 13.** Given three identical boxes I, II and III each containing two coins. In box I both coins are gold coins, in box II 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 ? **Ans. 2/3**
- 14.** Suppose that the reliability of a HIV test is specified as follows :  
Of people having HIV, 90% of the test detect the disease but 10% go undetected. Of people free of HIV, 99% of the test are judged HIV – ive but 1% are diagnosed as showing HIV+ive. From a large population of which only 0.1% have HIV, one person is selected at random, given the HIV test, and the pathologist reports him/her as HIV+ive. What is the probability that the person actually has HIV ? **Ans. 90/1089**
- 15.** 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. The ball so drawn is found to be red in colour. Find the probability that the transferred ball is black. **Ans. 16/31**
- 16.** Suppose that 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. **Ans. 20/21**
- 17.** 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 ? **Ans. 3/5**
- 18.** A letter is known to have come either from LONDON or CLIFTON. On the envelope just two consecutive letters ON are visible. What is the probability that the letter has come from (i) LONDON (ii) CLIFTON ? **Ans. 12/17**
- 19.** In a factory, machine A produces 30% of the total output, machine B produces 25% and the machine C produces the remaining output. If defective items produced by machines A, B and C are 1%, 1.2%, 2% respectively. These machines working together produce 10000 items in a day. An item is drawn at random from a day's output and found to be defective. Find the probability that it was produced by machine B ? **Ans. 0.2**
- 20.** A company has two plants to manufacture bicycles. The first plant manufactures 60% of the bicycles and the second plant 40%. Out of that 80% of the bicycles are rated of standard quality at the first plant and 90% of standard quality at the second plant. A bicycle is picked up at random and found to be standard quality. Find the probability that it comes from the second plant. **Ans. 3/7**
- 21.** Three urns A, B and C contain 6 red and 4 white, 2 red and 6 white, and 1 red and 5 white balls respectively. An urn is chosen at random and a ball is drawn. If the ball drawn is found to be red, find the probability that the ball was drawn from urn A. **Ans. 36/61**
- 22.** A is known to speak truth 3 times out of 5 times. He throws a die and reports that it is 1. Find the probability that it is actually 1. **Ans. 3/13**
- 23.** A factory has three machines A, B and C, which produce 100, 200 and 300 items of a particular type daily. The machines produce 2%, 3% and 5% defective items respectively. One day when the production was over, an item was picked up randomly and it was found to be defective. Find the probability that it was produced by machine A. **Ans. 2/23**

24. A bag contains 1 white and 6 red balls and a second bag contains 4 white and 3 red balls. One of the bags is picked up at random and a ball is randomly drawn from it and is found to be white in colour. Find the probability that the drawn ball was from the first bag. **Ans. 1/5**
25. A speaks the truth 8 times out of 10 times. A die is tossed. He reports that it was 5. What is the probability that it was actually 5 ? **Ans. 4/9**
26. For A, B and C the chances of being selected as the manager of a firm are the ratio 4:1:2 respectively. The respective probabilities for them to introduce a radical change in marketing strategy are 0.3, 0.8 and 0.5. If the change does take place, find the probability that it is due to the appointment of B or C. **Ans. 3/5**
27. An insurance company insured 2000 scooters and 3000 motorcycles. The probability of an accident involving a scooter is 0.01 and that of a motorcycle is 0.02. An insured vehicle met with an accident. Find the probability that the accidented vehicle was a motorcycle. **Ans. 3/4**
28. There are three coins. One is two headed coin, another is a biased coin that comes up heads 75% of the time and third is an unbiased coin. One of the three coins is chosen at random and tossed, it shows heads, what is the probability that it was the two headed coin ? **Ans. 4/9**
29. A laboratory blood test is 99% effective in detecting a certain disease when it is, in fact, present. However, the test also yields a false positive result for 0.5% of the healthy person tested (i.e. if a healthy person is tested, then, with probability 0.005, the test will imply he has the disease). If 0.1% of the population actually has the disease, what is the probability that a person has the disease given that his test result is positive ? **Ans. 198/1197**
30. If a machine is correctly set up it produces 90% acceptable items. If it is incorrectly set up it produces only 40% acceptable items. Past experience shown that 80% of the setups are correctly done. If after a certain set up, the machine produces 2 acceptable items, find the probability that the machine is correctly set up. **Ans. 0.95**

