

Department of Mathematics

Even Semester 2016-17

Probability Theory and Random Processes
Probability and Random Processes

10B11MA411
15B11MA301

Tutorial Sheet 1

B.Tech. Core

Probability

1. A card is taken from a well shuffled pack of 52 cards. What is the probability of getting (i) either a black card or an ace or both, (ii) either an ace of diamond or an ace of hearts, (iii) either a diamond card or an ace or both?
(Ans: (i) $7/13$, (ii) $1/26$ (iii) $4/13$)
2. A and B are 2 events associated with an experiment. If $P(A) = 0.4$ and $P(A \cup B) = 0.7$, find $P(B)$ if (i) A and B are mutually exclusive, (ii) A and B are independent.
(Ans: (i) 0.3, (ii) 0.5)
3. For any three events A, B and C, show that $P(A \cup B | C) = P(A | C) + P(B | C) - P(A \cap B | C)$.
4. Three switches connected in parallel operate independently. Each switch remains closed with probability p .
(a) Find the probability of receiving an input signal at the output. (b) Find the probability that switch S1 is open given that an input signal is received at the output.
(Ans: (i) $p^3 - 3p^2 + 3p$, (ii) $\{(1-p)(2p-p^2)\} / \{p^3 - 3p^2 + 3p\}$)
5. Companies A, B and C produces cars. The production capacity of company A is twice that of B while company B and C produces same number of cars in a given period. It is known that 2% of A, 3% of B and 4% of C are defective. All the cars produced are put into one showroom and then one car is chosen at random. (a) Find the probability that the car is defective. (b) Suppose a car chosen is defective, what is the probability that this is produced by company A?
(Ans: (i) $11/400$, (ii) $4/11$)
6. Two computers A and B are to be marketed. A salesman who is assigned the job of finding customers for them has 60% and 40% chances, respectively, of succeeding in case of computer A and B. The two computers can be sold independently. Given that he was able to sell at least one computer, what is the probability that computer A has been sold?
(Ans: 0.789)
7. If A, B and C are random events in a sample space and if A, B and C are pairwise independent and A is independent of $(B \cup C)$, then A, B and C are mutually independent.
8. Two digits are selected at random from the digits 1 through 9. If the sum is even, find the probability that both the numbers are odd.
(Ans: $5/8$)
9. A and B throw alternatively with a pair of balanced dice. A wins if he throws sum of six points before B throws a sum of seven points, while B wins if he throws a sum of seven points before A throws a sum of six points. If A begins the game, show that his probability of winning is $30/61$.
10. One card is drawn at random from 50 cards numbered 1 to 50. Find the probability that the number on the card is (i) divisible by 3 or 4 or both, (ii) prime number less than 37, (iii) ends in 2 or 3. (Ans: (i) $12/25$, (ii) $11/50$, (iii) $1/5$)
11. There are 4 true coins and 1 false coin with head on both sides. A coin is chosen at random and tossed 5 times. If head occurs all the 5 times, what is the probability that the false coin has chosen and used?
(Ans: $8/9$)
12. A letter is known to have come either from TATANAGAR or from CALCUTTA. On the envelope just two consecutive letters TA are visible. What is the probability that the letter came from CALCUTTA?
(Ans: $4/11$)
13. A speaks truth 4 out of 5 times. A die is tossed. He reports that there is a six. What is the chance that actually there was six?
(Ans: $4/5$)
14. A and B are two weak students of the course "Probability Theory" and their chances of solving a problem in "Probability Theory" correctly are $1/6$ and $1/8$, respectively. If the probability of their making a common error is $1/525$ and they obtain the same answer, find the probability that their answer is correct.
(Ans: $15/16$)