

Department of Computer Science and Engineering
M.Tech. I Computer Science and Engineering
Mathematical Foundations of Computer Science CSE 601

Tutorial 2

1. Define a uniform probability density function on the standard deck of cards. Determine the probability of drawing one of the 3's and the probability of drawing a face card (Jack, Queen, or King).
2. Two parts are chosen at random from a bin containing 10 parts, three of which are defective. What is the probability that at least one of the parts chosen is good?
3. A small zoo records the proportions of visitors who prefer various animals as their favourites. Suppose that the elephants are preferred by 15%, the monkeys by 25%, the polar bears by 30%, the seals by 20%, and the boa constrictors by 10%. Suppose we are going to select a visitor at random and ask what animal that person prefers.
 - a. Set up a sample space S , and define a probability density on it using the given data.
 - b. Reformulate the descriptions of the following events as subsets of S :
 - i. The preferred animal has four legs
 - ii. The preferred animal has legs
 - iii. The preferred animal has either a trunk or flippers.
4. In the communication network, three devices A, B, and C connected by ring topology. Each link between three devices may be up or down. Assuming that the nodes connecting the links are always functioning and that failures of the links are not related, what is the probability that a functioning set of links is connecting node A to node C? The link between device A and device B functions with probability 0.9. The link between B and C functions with 0.8 probability value. The link between C and A functions with probability 0.5.
5. Communication Channel Reliability: Consider a noisy communication channel over which a 0 or a 1 is to be sent. Suppose that the probability the bit to be sent is a 0 is 0.4 and the probability that it is a 1 is 0.6. Also, suppose that due to noise, the probability that a 0 is changed to a 1 during transmission is 0.2 and the probability that a 1 is changed to a 0 is 0.1 (refer the diagram channel presented in the class). Suppose a 1 is received. What is the probability that a 1 was sent?
6. Suppose apples are shipped to
7. a grocery store by three different orchards O_1 , O_2 , and O_3 . Suppose the percentages of each shipment that are bad are 10%, 8%, and 3%, respectively. Suppose further that the percentages of the apple supply from these orchards are 20%, 30%, and 50%, respectively. Now, suppose a customer selects an apple at random and finds that it is bad. What is the probability the apple came from orchard O_2 ?
8. Suppose our manufacturing company purchases a certain part from three different suppliers S_1 , S_2 , and S_3 . Supplier S_1 provides 40% of our parts, and suppliers S_2 and S_3 provide 35% and 25%, respectively. Furthermore, 20% of the parts shipped by S_1 are defective, 10% of the parts shipped by S_2 are defective, and 5% of the parts from S_3 are defective. Now, suppose an employee at our company chooses a part at random.
 - a. What is the probability that the part is good?
 - b. If the part is good, what is the probability that it was shipped by S_1 ?
 - c. If the part is defective, what is the probability that it was shipped by S_1 ?