

IC566: Random Signals and Random Processes (Spring 2018)

Assignment 1 (Due: March 29, 2018)

1. Consider a random experiment of tossing two fair dices.
 - (a) Find the sample space S .
 - (b) Find the event A and its probability that the sum of the dots on the dice equals 6.
 - (c) Find the event B and its probability that the sum of the dots on the dice is greater than 10.
2. Mary has three children. One child is a girl. What is the probability that she has a boy as well?
3. There are n persons in a room.
 - (a) What is the probability that at least two persons have the same birthday?
 - (b) Calculate the probability for $n=50$.
 - (c) How large n is needed for the probability to be greater than 0.5?
4. A company producing electric relays has three manufacturing plants #1, #2, and #3, producing 50, 30, and 20 percent, respectively, of its product. Suppose that the probabilities that a relay manufactured by these plants is defective are 0.01, 0.04, and 0.10, respectively.
 - (a) If a relay is selected at random from the output of the company, what is the probability that it is defective?
 - (b) If a relay selected at random is found to be defective, what is the probability that it was manufactured by plant 2?
5. A *Bernoulli* experiment is a random experiment, the outcome of which can be classified in but one of two mutually exclusive and exhaustive ways, that is, success or failure. A sequence of Bernoulli trials occurs when a Bernoulli experiment is performed several independent times so that the probability of success, say p , remains the same from trial to trial. Now an infinite sequence of Bernoulli trials is performed. Find the probability that
 - (a) at least 1 success occurs in the first n trials
 - (b) exactly k successes occur in the first n trials
 - (c) all trials result in successes
6. In the experiment of tossing two fair dice, let A be the event that the first die is odd, B be the event that the second die is odd, and C be the event that the sum is odd. Show that the events A , B , and C are pairwise independent, but A , B , and C are not.
7. Two cards are drawn at random from a deck. What is the probability that both are aces?