Assignment 4

CS 310: Discrete Computational Structures

University of Regina

Department of Computer Science

Fall 2018

1. (5 points) What is the probability that a card selected at random from a standard deck of 52 cards is an ace or a heart?

2. (5 points) What is the probability that a five-card poker hand contains the ace of hearts?

3. (5 points) What is the probability that a five-card poker hand contains exactly one ace?

4. (8 points) Find the probability of winning a lottery by selecting the correct six integers, where the order in which these integers are selected does not matter, from the positive integers not exceeding

   (a) 30.

   (b) 36.

   (c) 42.

   (d) 48.

5. (12 points) Find the probability of selecting none of the correct six integers in a lottery, where the order in which these integers are selected does not matter, from the positive integers not exceeding

   (a) 40.

   (b) 48.

   (c) 56.

   (d) 64.

6. (10 points) In a superlottery, a player selects 7 numbers out of the first 80 positive integers. What is the probability that a person wins the grand prize by picking 7 numbers that are among the 11 numbers selected at random by a computer.

7. (10 points) What is the probability that a player of a lottery wins the prize offered for correctly choosing five (but not six) numbers out of six integers chosen at random from the integers between 1 and 40, inclusive?

8. (10 points) Suppose that 100 people enter a contest and that different winners are selected at random for first, second, and third prizes. What is the probability that Kumar, Janice, and Pedro each win a prize if each has entered the contest?

9. (5 points) Find the probability of each outcome when a loaded die is rolled, if a 3 is twice as likely to appear as each of the other five numbers on the die.

10. (10 points) What is the probability of these events when we randomly select a permutation of $\{1, 2, 3\}$?

    (a) 1 precedes 3.

    (b) 3 precedes 1.

    (c) 3 precedes 1 and 3 precedes 2.

11. (5 points) What is the conditional probability that exactly four heads appear when a fair coin is flipped five times, given that the first flip came up tails?

12. (5 points) Let E be the event that a randomly generated bit string of length three contains an odd number of 1s, and let F be the event that the string starts with 1. Are E and F independent?

13. (5 points) Suppose that Ann selects a ball by first picking one of two boxes at random and then selecting a ball from this box. The first box contains three orange balls and four black balls, and the second box contains five orange balls and six black balls. What is the probability that Ann picked a ball from the second box if she has selected an orange ball?

14. (5 points) When a test for steroids is given to soccer players, 98% of the players taking steroids test positive and 12% of the players not taking steroids test positive. Suppose that 5% of soccer players take steroids. What is the probability that a soccer player who tests positive takes steroids?