CARLETON UNIVERSITY
SCHOOL OF COMPUTER SCIENCE
WINTER 2019

Comp 5005 — Assignment I — Due Jan. 17, 2019

1. Suppose each of three persons tosses a coin. If the outcome of one of the tosses differs from the other outcomes, then the game ends. If not, then the persons start over and re-toss their coins. Assuming fair coins, what is the probability that the game will end with the *second* round? If all three coins have a probability 1/4 of landing heads, what is the probability that the game will end at the first round?

2. Assume that each child born is equally likely to be a boy or a girl. If a family has three children, what is the probability that they will all be boys, given that (a) the eldest is a boy, (b) at least one is a boy?

3. Two fair dice are rolled. What is the probability that at least one has a value greater than or equal to '4'? If the two faces are different, what is the probability that at least one has a value greater than or equal to '4'?

4. Five fair dice are thrown. What is the probability the same number appears on at least two of the five?

5. Suppose that 3 percent of men and 4 percent of women are color-blind. A color-blind person is chosen at random. What is the probability of this person being male? Assume that there are an equal number of males and females.

6. If you have two fair dice, what is the conditional probability that the roll of the first die is '4' given that the sum of the dice is seven?

7. In a class there are 'a' first year male students, 'b' first year female students, and 'c' second year male students. How many second year *female* students must be present if gender and class are to be independent when a student is selected at random?

8. Consider two boxes, one containing nine black and six white marbles, the other twelve black and eight white marbles. A box is selected at random and a marble is drawn at random from the selected box. What is the probability that the marble is black? What is the probability that the first box was selected given that the marble is white?

9. Urn 1 contains four white balls and eight black balls, while Urn 2 contains six white balls and nine black balls. One ball is drawn at random from Urn 1 and placed in Urn 2. A ball is then drawn from Urn 2. It happens to be white. What is the probability that the transferred ball was white?

10. Stores *A, B*, and *C* have 30, 50 and 70 employees, and respectively 40, 50, and 60 percent of these are women. Resignations are equally likely among all employees, regardless of gender. One employee resigns and this is a woman. What is the probability that she works in store *C*?

11. (a) A gambler has in his pocket a fair coin and a two-headed coin. He selects one of the coins at random, and when he flips it, it shows heads. What is the probability that it is the fair coin? (b) Suppose that he flips the same coin a second time and again it shows heads. What is now the probability that it is the fair coin? (c) Suppose that he flips the same coin a third time and it shows tails. What is now the probability that it is the fair coin?

12. There are three coins in a box. One is a two-tailed coin, another is a fair coin, and the third is a biased coin which comes up heads 60 percent of the time. When one of the three coins is selected at random and flipped, it shows tails. What is the probability that it was the two-tailed coin?

13. Suppose we have four coins which are such that if the i^{th} one is flipped, heads will appear with probability $i/8$, $i=1,2,3,4$. When one of the coins is randomly selected and flipped, it shows heads. What is the conditional probability that it was the fourth coin?

14. Urn 1 has eight white and seven black balls. Urn 2 has three white and seven black balls. We toss a fair coin. If the outcome is heads a ball from Urn 1 is selected, and if the outcome is tails a ball from Urn 2 is selected. Suppose that a white ball is selected. What is the probability that the coin landed tails?

15. A urn contains *b* black and *r* red balls. One of the balls is drawn at random, but when it is put back, *c* additional balls of the same color are put in with it. Suppose that we draw another ball. What is the probability that the first ball drawn was black given that the second ball drawn was red?