Exercise 1D.1

A bag contains 3 red balls and 2 blue balls. Define the events:

$A =$ get a red on the first draw

$B =$ get a blue on the second draw assuming the first ball is removed (but you don't know the color)

What is $P(B)$?

Hint: Use the Law of Total Probability

Exercise 1D.2

There are three candidates in the election for governor of a certain state, Mr. Bluth, Ms. Fünke, and Mr. Loblaw. The biggest campaign issue is that of lowering property taxes. If Mr. Bluth is elected there is an 80% chance that he will lower taxes, if Ms. Fünke is elected there is a 10% chance she will lower taxes, and if Mr. Loblaw is elected there is a 55% chance he will lower taxes. The last election poll showed that there was a 60% chance that Mr. Bluth would win the election, a 20% chance that Ms. Fünke will win, and a 20% chance that Mr. Loblaw will win. What is the probability that property taxes will be lowered after the election?

Hint: Use the Law of Total Probability

Exercise 1D.3

A pregnancy test claims that it is "99% accurate" – if 100 pregnant woman took the test, 99 of them would get a positive result. If 100 non-pregnant women took the test, 10 would (falsely) test positive. Jane takes a pregnancy test and it comes up positive.

(a) Assume that the overall proportion of pregnant women in the population is 5%. What is the probability that Jane really is pregnant?

(b) Assume that the overall proportion of pregnant women in the population is 50%. What is the probability that Jane really is pregnant?

Exercise 1D.4

Suppose on a particular multiple choice exam, a student has a 1 in 4 chance of getting the question right if she does not know the correct answer.

(a) If the student guesses on 15% of the questions, what percentage of all the questions on the test do you expect the student to answer correctly?

(b) Given that the student got a particular answer correct, what is the probability that she actually knew the answer?

Exercise 1D.5

Patients with newly diagnosed heart failure can be treated at three hospitals: A, B, and C. Suppose that for a particular year, 500 patients went to A, 200 went to B, and 300 went to C (no patient went to more than one hospital). The proportions of patients who survived for at least 6 months were 50%, 80%, and 75%, at hospitals A, B, and C, respectively.

(a) What is the probability that a randomly selected patient was treated at hospital A or B?

(b) What is the probability that a randomly selected patient was treated at hospitals A and B?

(c) What is the probability that a patient who was treated at hospital B survived at least 6 months?

(d) What is the probability that a randomly selected patient was treated at hospital B and survived at least 6 months?

(e) Sue and Joe both went to hospital B. What is the probability they both survived at least 6 months?

(f) Given that Danielle survived at least 6 months, what is the probability that she went to hospital B?