Math 302 HW assignment 2. Due Friday, July 18 at start of class

Note: Write your name and your student number on each page that you submit. Show all your work! Separate the solutions of different exercises with a line. Draw a frame around your final answer (if it is a number).

1. 40 percent of Canadians wear a ring on their left hand, 30 percent of them wear a ring on their right hand, and 35 percent of them has no ring at all.

   (a) (2 marks) What is the probability that a random Canadian has rings on both hands?
   (b) (2 marks) What percentage of them has a ring on exactly one hand?

2. In a class of 30 students, 3 foreign languages are thought: Russian, Polish and Spanish. 9 students attend (at least) Spanish class, 11 students attend (at least) Polish and 13 attend (at least) Russian. 4 attend (at least) Spanish and Russian, 3 attend (at least) Spanish and Polish, 5 attend (at least) Polish and Russian. 2 attend all the three languages.

   (a) (2 marks) What is the prob. that a randomly chosen student learns a Slavic language?
   (b) (3 marks) How many students learn no foreign language at all?

3. A die is rolled four times. What is the probability that the highest number is . . .

   (a) (2 marks) at least 4?
   (b) (3 marks) exactly k (where $1 \le k \le 6$)?

4. One percent of the buses in Vancouver carry one passenger, one percent carries 2 passengers, one percent carries 3 passengers, etc., one percent carries 100 passengers.

   (a) (1 mark) What is the prob. that a random bus has more than 50 passengers?
   (b) (4 marks) I call a friend on his cell phone and I find that he is travelling on a bus. What is the probability that his bus has more than 50 passengers?

5. An urn contains a black and a white marble. I randomly pick a marble, look at it, put it back and also put a new marble in the urn which has the same colour as the one that I just picked. I repeat this procedure. When there are . . .

   (a) (2 marks) four marbles in the urn, what is the prob. that two of them are black?
   (b) (2 marks) five marbles in the urn, what is the prob. that three of them are white?
   (c) (3 marks) 100 marbles in the urn, what is the prob. that 38 of them are white?

6. (3 marks) Ulysses on one of his quests arrives to a triple junction. He knows that one of the roads leads to Athens, the second to Mycenae and the third to Sparta, but he doesn't know which road leads to which city. He also knows that the people of Athens only tell the truth one for third of the time, people of Mycenae tell the truth half of the time and that the people of Sparta never lie. He threw a die to decide which road to choose, giving equal chance to all three options. When he arrived to a city he asked the first man what the Pythagorean theorem was and the man replied "$a^2 + b^2 = c^2$". What is the probability that Ulysses ended up in Athens?

7. Every male customer of an automobile insurance company files a claim every year, independently from the other year, with probability p_m. Every female customer files a claim every year independently from the other year, with probability p_f, where $p_m \ne p_f$. We know that $\alpha \cdot 100$ percent of the customers are male. Let us track a randomly chosen customer for two consecutive years and denote by A_i the event that the customer files a claim in year i, where $i = 1, 2$.

   (a) (4 marks) Which probability is bigger, $\mathbf{P}(A_2)$ or $\mathbf{P}(A_2|A_1)$? (calculate both and compare)
   (b) (3 marks) If $p_m = 0.015$, $p_f = 0.01$ and $\alpha = 0.6$, what is the probability that the customer is male if we know that he/she filed exactly one claim in these two years?