MA/STAT 416 Spring 2020
Probability

Midterm Exam

- You can use a calculator.
- A 2 pages long handwritten cheat sheet is allowed. It should only contain formulae and theorems (no example, no solved problem).
- You have 60 minutes.
- Show your work.
- In order to get full credits, you need to give correct and simplified answers and explain in a comprehensible way how you arrive at them.
- GOOD LUCK!

Name:

Problem 1. [20 points] Jasmin has \$120. She wants to donate part of this money (that is an amount less or equal to \$120) to 4 different charities. The donations should be in units of \$10. Some charities might get \$0. Count the number of ways Jasmin can donate her money.

Solution:

Problem 2. [20 points] In a 5 cards poker game, one receives a hand of 5 cards. In this context, find the probability of getting "Three of a kind" (that is exactly three same numbers/letters and 2 different cards).

Solution:

Problem 3. [20 points] A pair of dice is rolled until a sum of either 5 or 7 appears. Find the probability that a 5 occurs first. Be sure to define the sample space S corresponding to this experiment, as well as the probability $\mathbf{P}$ you are using on this sample space.

Solution:

Problem 4. [20 points] The BIG 10 league has 14 schools in spite of its name. 6 teams are considered as *contenders* and other 8 teams are considered as *pretenders*. If a team is a contender, the probability that the team goes to a bowl game is 0.6. If a team is a pretender, the probability that the team goes to a bowl game is 0.3. What is the (conditional) probability that a team goes to a bowl game in the second year when the team also went to a bowl game in the first year?

Solution:

Problem 5. [20 points] Suppose that there are 5 types of coupons. The probability to collect a type i coupon is $p_i = ki$, for a constant k such that $\sum_{i=1}^{5} p_i = 1$. Each new coupon is collected independently of previous selections. Suppose that 8 coupons are to be collected. If A_i is the event that there is at least one type i coupon among those collected, find
(a) $\mathbf{P}(A_2 \cup A_3)$
(b) $\mathbf{P}(A_2|A_3)$

Solution: