## **APMA 1650**

## Homework 3

**Instructions**: Homework is due by 11:59pm EST in Gradescope on the day listed on the course webpage. You can use calculators for this assignment. Solutions must be written independently and *cannot* be shared with any other students.

You must *show all work* and *explain your answers thoroughly* to get full credit. You will be graded partly on how well you explain the answers.

There will be a 5pt penalty for homework submitted with problems incorrectly assigned to a page. A 10pt penalty will be applied for homework submitted during the late window.

1. (20 pts) Consider two parallel lines, one with n distinct points on it and the other with m distinct points on it.

- a. (10 pts) How many triangles (three sided shapes) can you make with these points?
- b. (10 pts) How many quadrilaterals (four sided shapes) can you make with these points?

2. (14 pts) A "hacker" is trying to break into your Brown account. They got their hands on a list of 18 passwords and one of them is yours! They start tying random passwords from this list, never re-trying a password. However, after 5 failed attempts, they will be locked out of your account. What is the probability that they successfully "break-in" to your account before getting locked out?

**3.** (20 pts) There are two groups of students at a review session. One group (APMA students) has 8 people and the other group (CS students) has 4 people.

- a. (10 pts) If 3 people are chosen from each group to partner up, how many possible pairings are there?
- b. (10 pts) Suppose instead, all of the students are randomly divided up into groups of size 3. What is the probability that that each group contains a CS student?

**4.** (18 pts)

- a. (8 pts) How many distinct ways can you arrange the letters in the word NARRA-GANSETT?
- b. (10 pts) If you pick one of these distinct rearrangements at random, what is the probability that the letters G and S are not next to each other?

**5.** (28 pts) 5 cards are dealt from a modified 48 card deck. In this deck, there are still exactly 4 suits  $(\heartsuit, \diamondsuit, \clubsuit, \clubsuit)$  but only 12 ranks in the following order (2,3,4,5,6,7,8,9,10,J,Q,K) (the Aces are missing).

- a. (8 pts) What is the probability that exactly two cards have the same rank?
- b. (10 pts) What is the probability that there is exactly one pair of one rank, one pair of a different rank and the remaining card has a third rank? (e.g.  $3\heartsuit, 3\spadesuit, 7\heartsuit, 7\diamondsuit, K\clubsuit$ )
- c. (10 pts) What is the probability that your hand contains 5 cards of sequential rank (e.g. 8,9,10,J,Q)?