Submission and Due dates:

This problem set is due Sunday November 6th at 10pm

- You may collaborate with your peers, make sure to include it explicitly in your submission.

- Show your work. Direct answers will not be accepted.

- Submit your work through gradescope

Instructions:

1. The door to a building has a lock which has 5 buttons numbered from 1 to 5. The combinations of numbers that opens the lock is a sequence of 5 numbers and is reset every week.

   a. How many combinations are possible if every button must be used once?

   b. Assume that the lock can also have combinations that require you to push 2 buttons simultaneously, and then the other three one at a time. How many combinations does this permit? To clarify, in a sequence of 5 buttons, 2 consecutive buttons **must** be pressed at the same time to be considered correct.

2. A computer has 3 processors that receive *n* tasks. Tasks are assigned to the processors purely at random, meaning that all 3^n possible assignments are equally likely. How many possible assignments are there where exactly one processor has no task assigned?

3. In how many ways can we choose five people from a group of ten to form a basketball team?

4. Show that $\binom{n}{k} = \binom{n-1}{k-1} + \binom{n-1}{k}$

5. Someone wants to color their fingernails on one hand using at most 2 of the colors red, yellow, and blue. How many ways can they do this?

References:

These problems were drawn from chapter 3 of Introductions to probability as well as Discrete Mathematics- An open introduction