DSC 40A - Group Work Session 6
due November 12, 2021 at 11:59pm

Write your solutions to the following problems by either typing them up or handwriting them on another piece of paper. You must work in a group of 2 to 4 students for at least 50 minutes to get credit for this assignment. It's best to join a discussion section if possible.

One person from each group should submit your solutions to Gradescope by 11:59pm on **Friday (note the extended deadline)**. Make sure to **tag all group members** so everyone gets credit. This worksheet won't be graded on correctness, but rather on good-faith effort. Even if you don't solve any of the problems, you should include some explanation of what you thought about and discussed, so that you can get credit for spending time on the assignment.

Throughout this assignment, you are allowed to leave your answers in terms of factorials, the permutation formula $P(n, k)$, and the binomial coefficient $\binom{n}{k}$, unless otherwise stated.

Problem 1. Herb and Garlic

You want to plant an herb garden, so you go to a garden store that has 50 different herbs: 28 are culinary herbs, 12 are medicinal herbs, and 10 are aromatic herbs. You select 5 herbs for your herb garden by taking a random sample **without replacement** from the 50 available herbs.

a) If you consider the herbs you select as a permutation (i.e. the order in which you select each herb matters), how many permutations of 5 herbs are possible?

b) If you consider the herbs you select as a permutation (i.e. the order in which you select each herb matters), how many permutations of 5 herbs include 2 culinary herbs and 3 aromatic herbs?

Hint: If you're stuck, you may want to complete part (d) first, then come back to this part using the relationship between permutations and combinations we discussed in lecture.

c) If you consider the herbs you select as a combination (i.e. the order in which you select each herb does not matter), how many combinations of 5 herbs are possible?

d) If you consider the herbs you select as a combination (i.e. the order in which you select each herb does not matter), how many combinations of 5 herbs include 2 culinary herbs and 3 aromatic herbs?

e) What is the probability that you choose 2 culinary herbs and 3 aromatic herbs for your garden?

Problem 2. Shuffling Strings

For this problem in particular, but also for the entire worksheet and the homework, you may find it helpful to refer to **these slides (link)**. However, we strongly encourage you to attempt the problem first before looking at these slides.

In this problem, a "permutation" will refer to a permutation of the entire string (i.e. we are selecting n elements from a group of n possible elements, without replacement, such that order does matter).

a) How many permutations are there of the string DOG?

b) How many permutations are there of the string GAG?

Hint: The answer is not 6.

c) How many permutations are there of the string GAAAGGGG?

    Hint: How can you use combinations?

d) How many permutations are there of the string LAJOLLA (with no spaces)?

    Hint: Start by writing out the frequency of each character.

Problem 3. Billy the Builder

Suppose you have 2 identical yellow blocks, 2 identical green block, 3 identical blue blocks, and 3 identical red blocks. How many different-looking towers of 10 blocks can you create by stacking all of these blocks on top of one another in one tall stack?

Hint: If you think about it a certain way, this problem is very similar to Problem 2.