
DSC 40A - Group Work Session 7
due February 23, 2022 at 11:59pm

Write your solutions to the following problems by either typing them up or handwriting them on another piece of paper. **One person** from each group should submit your solutions to Gradescope and **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.

In order to receive credit, you must work in a group of two to four students for at least 50 minutes, at one of the scheduled groupwork sessions. You may not do the groupwork alone or meet outside of the scheduled sessions.

Throughout this assignment, please **leave your answers unsimplified**, in terms of factorials, exponents, the permutation formula $P(n, k)$, and the combination formula $C(n, k) = \binom{n}{k}$.

Problem 1. Herb Garden

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 combination (i.e. the order in which you select each herb does not matter), how many combinations of 5 herbs are possible?
- b) 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?
- c) 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?
- d) 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?
- e) What is the probability that you choose 2 culinary herbs and 3 aromatic herbs for your garden?

Problem 2. Shuffling Strings

- a) How many different strings can be created by shuffling the letters of DOG?
- b) How many different strings can be created by shuffling the letters of GAG?
Hint: The answer is not 6.
- c) How many different strings can be created by shuffling the letters of GAAAGGGG?
Hint: How can you use combinations?
- d) How many different strings can be created by shuffling the letters of AGGRAVATE?

Problem 3. Xs and Os

Let $N(a, b)$ represent the number of strings you can create out of a Xs and b Os. Explain why $N(a, b)$ satisfies each of the following:

$$N(0, b) = 1 \tag{1}$$

$$N(a, 0) = 1 \tag{2}$$

$$N(a, b) = N(a - 1, b) + N(a, b - 1) \quad \text{for } a > 0 \text{ and } b > 0. \tag{3}$$