

MATH220: Discrete Structures

Spring 2024

Homework 04: Functions and Counting

Assignment is DUE as indicated on the course schedule.

*This is a **group assignment**. Work with 1-2 classmates, and submit as a group on Gradescope.*

Notes

Your final submission must be readable. It is your responsibility to write up your answers in a way that is easy to read and follow. You may handwrite your answers or type them, and you can submit a PDF or images on Gradescope.

Be sure to show *all* of your work for full credit!

Problems

1. Let $f(x, y) = (2x - y, x - 2y)$, $(x, y) \in \mathbb{R} \times \mathbb{R}$. Prove that f is one-to-one.
2. If a set A has n elements, how many functions are there from A to A ?
3. If a set A has m elements and B has n , how many functions are there from A to B ?
4. A coin is tossed four times and the result of each toss is recorded. How many different sequences of heads and tails are possible?
5. How many different arrangements of the letters in the word BOUGHT can be formed if the vowels must be kept next to each other?
6. Prove that there are $(n - 1)!$ different ways for n people to be seated around a circular table.
7. In how many ways can a six-card hand be dealt from a deck of 52 cards?
8. Five fair coins are tossed and the results are recorded.
 - a. How many different sequences of heads and tails are possible?
 - b. How many of the sequences in part (a) have exactly one head recorded?
 - c. How many of the sequences in part (a) have exactly three heads recorded?

Submission

Submit on Gradescope. Remember to tag your groupmates!

Rubric

| | Missing / Not Complete (0) | Approaching (2) | Meets (4) | Exceeds (5) |
|---------------------|--|---|---|--|
| Readability | Assignment is unreadable or not submitted. | Assignment includes formatting, but significant improvements could be made. For example, clear labeling of problems and subparts, proofreading. | Assignment includes formatting, but minor improvements could be made. For example, clear labeling of problems and subparts, proofreading. | Assignment is well formatted and easy to read. Text has been proofread. |
| Completeness | Less than half of assignment is attempted. | Roughly half of assignment has been attempted. On the problems that have been completed, effort is evident. OR All of the assignment has been attempted, but effort is not evident in many parts. | At least 80% of assignment has been attempted. On the problems that have been completed, effort is evident. OR All of the assignment has been attempted, but effort is not evident a few parts. | All of the assignment has been attempted, and effort evident throughout. |
| Correctness | All answers are incorrect or missing. | Of the complete problems, at least half have been approached correctly. | Of the complete problems, at least 80% have been approached correctly. | All complete problems are approached correctly. |