CSCE 222 Discrete Structures for Computing – Fall 2023
Hyunyoung Lee

Problem Set 6

Due dates: Electronic submission of *yourLastName-yourFirstName-hw6.tex* and *yourLastName-yourFirstName-hw6.pdf* files of this homework is due on **Monday, 11/6/2023 before 11:59 p.m.** on `https://canvas.tamu.edu`. You will see two separate links to turn in the .tex file and the .pdf file separately. Please do not archive or compress the files. **If any of the two files are missing, you will receive zero points for this homework.** Your files must contain your first and last names and UIN in the given spaces and the electronic signature (your full name) correctly.

Name: Kevin Lei **UIN: 432009232**

Resources. (All people, books, articles, web pages, etc. that have been consulted when producing your answers to this homework)

On my honor, as an Aggie, I have neither given nor received any unauthorized aid on any portion of the academic work included in this assignment. Furthermore, I have disclosed all resources (people, books, web sites, etc.) that have been used to answer this homework.

Electronic signature: Kevin Lei

Total 100 points. For a counting problem, *careful, detailed explanation* will be worth majority (about 80%) of your grade.

The intended formatting is that this first page is a cover page and each problem solved on a new page. You only need to fill in your solution between the `\begin{solution}` and `\end{solution}` environment. Please do not change this overall formatting.

Checklist:
- ☐ Did you type in your name and UIN?
- ☐ Did you disclose all resources that you have used? (This includes all people, books, websites, etc. that you have consulted)
- ☐ Did you sign that you followed the Aggie Honor Code?
- ☐ Did you solve all problems?
- ☐ Did you submit both the .tex and .pdf files of your homework to each correct link on Canvas?

Problem 1. (10 points) Section 12.1, Exercise 12.4. Specify what counting principle(s) you are using. Also explain carefully how you got your final answer.

Solution.

Problem 2. (10 points) Section 12.1, Exercise 12.5. Specify what counting principle(s) you are using. Also explain carefully how you got your final answer.

Solution.

Problem 3. (15 points) Section 12.1, Exercise 12.9. Specify what counting principle(s) you are using. Also explain carefully how you got your final answer.

Solution.

Problem 4. (10 points) Section 12.2, Exercise 12.19. Specify what counting principle(s) you are using. Also explain carefully how you got your final answer.

Solution.

Problem 5. $(10 + 10 = 20$ points) Section 12.3, Exercise 12.27. For (a), use the formula involving the factorials. For (b), use the hint given in the problem statement, and explain carefully your double counting (combinatorial) proof in your own words.

Solution.

Problem 6. (15 points) Section 12.6, Exercise 12.50. Explain your reasoning carefully in your own words and show your work step-by-step. [Hint: Consider the three sets: Set 1 with page numbers that contain a 1 in the least significant (1s) digit; set 2 with those that contain a 1 in the middle (10s) digit, and set 3 with those that contain a 1 in the most significant (100s) digit.]

Solution.

Problem 7. (20 points) What is the smallest number of ordered pairs of integers (x, y) that are needed to guarantee that there are three ordered pairs $(x_1, y_1), (x_2, y_2)$, and (x_3, y_3) such that x_1 **mod** $5 = x_2$ **mod** $5 = x_3$ **mod** 5 and y_1 **mod** $4 = y_2$ **mod** $4 = y_3$ **mod** 4? Explain your reasoning carefully. [Hint: This problem is about Pigeonhole Principle (Section 12.7). Carefully think what are the pigeonholes and what are the pigeons here.]

Solution.