Comp 305 Spring 2021 — Algorithms and Complexity — Final Project Room 31

1 Introduction

In this project, you are given a programming question, and you will develop an efficient algorithm and implement it. You can use any of the programming languages you prefer, there is no limitation. However, usage of any libraries except the standard language library are forbidden. Please request permission if you plan to use any of these (if you are using Python, NumPy is allowed).

Please open the Google Sheet Link, and enter your group number, names of the members and the emails of the members to the cell, where your project is listed. Please keep in mind that the sheet document is divided into different sub-sheets. Thus, select the correct sub-sheet with respect to your group number. All of the test cases for each of the projects can be viewed and downloaded from this Google Drive Link.

Please open a GitHub public repository, include all of your members as contributors and add the repository link to the given Google Sheet document. This step is quite important for us to see your progress and has to be done quickly. Therefore, in the README file please keep a list of completed steps, a TO DO list and the results retrieved if there are any. You will also prepare a presentation and present to the TAs. Therefore, you should also create a Google Slides presentation and include its link to the Google Sheet document.

Please email to *comp305staff-group@ku.edu.tr*, if there is any problem in viewing the drive folder or modifying the document or if you have some troubles with any of the test cases.

2 Presentation Details

Each of the presentations should take ∼10 minutes and there will be a 5-minute Q&A session afterwards. If a presentation lasts longer than 10 minutes, then it will be interrupted. During the presentation each of the groups should explain and report:

- The algorithm you designed to solve the problem, the choices of the data structures you used and your reasoning.
- The time complexity of your algorithm (and the space complexity if applicable).
- Your run times for each of the test cases.
- Further improvements that can be done as future works.

This project does not expect from you to come up with just one solution and then test only that solution. For each of the problems you can start with some baseline approaches with more complexity and improve the baseline algorithm step by step. Be as creative as possible. Report different approaches you tested and why did you decide on the final algorithm you present. Your grading will be based on your creativity, your cumulative progress and how well did you present your approach.

Additionally, there will be more test cases which won't be provided to you. Therefore, to be sure about the correctness of your algorithm, you should create extra test cases. Finally, having an efficient and fast algorithm is also as important as having correct algorithm. Do your best to find the most efficient and fastest solution. Your effort is really important in grading.

3 Deadlines

You can work on your project until the end of ***23th May, 2021***. The project presentations will be held between ***24th-28th of May, 2021***.

Your Choice

You are a TV show host called "Your Choice". In this show, you have a guest at every episode and you play a game with your guest. The format is as follows: for every round of the game, from N boxes, you offer a box (numbered from 0 to N-1) to the guest, the guest chooses to take the box and drop her current box , or to keep her box and reject the new box. Then the new round starts and you again offer a new box, and the guest makes her choice again, so on so on... At the end of the game the guest opens her final box and wins the price in the box. You offer each box exactly once.

You are a soft hearted host and you lead your guest to the box P with the biggest price. Surprisingly, your media team interviewed your guest before the show and you know exactly what your guest's choice would be in each round (e.g. when she has box-1 and you ask to accept/reject box-5 you know whether she will accept or not).

Your task is the following: by using this interview information, order the boxes that you will offer your guest in such a way that at the end she will have the box with the biggest price.

You may assume that the guest will start the game with first showed box.

If there is no applicable solution with a given P, your code should print out 'IMPOSSIBLE'

Your code should accept an input file with the given format, and should output a file with the given format.

Input file format:
T: The number of test cases
N: Number of boxes, P: the id of box which has the biggest price
For the following N lines:
N symbols to indicate the guest's choice: Y if the guest prefers box-i to box-j, N if the guest prefers box-j to box-i.

Output file format:
D: The order of boxes you should offer in this case

Example input file:
3
2 0
-Y
N-
2 0
-N
Y-
4 3
-YNN
N-YY
YN-Y
YNN-

Example output file:
0 1
IMPOSSIBLE
1,2,0,3

For example case 3:
If we follow the order 1,2,0,3 to offer the boxes: the guest will start the game with box-1. Then you will offer box-2,

since the guest will prefer box-2 to box-1, she will drop box-1 and take box-2. Then you will offer box-0 and her choice will be to take box-0. Finally when you offer box-3, she will drop the box-0 and will finish the game with box-3 which is what we exactly want.