Home Assignment 1
DSA-Refresher 2021

- **You are not supposed to discuss solutions with your classmates or refer to any online resources. Strict Plagiarism policy applies.**
- **Naming Convention: Submit a pdf containing answers to given problem, Naming Convention for file is RollNo_Name_A1_DSARef21.pdf**
- **Please start early to complete within time.**

1. DJ Mixing:

Frisk becomes a DJ, after a long break. As you know DJ mixes beats in songs in order to make remix songs.He has composed some beat-cues(sequence of beats) previously and rocked the stage.But now he feels like he would add some twist in the beats.

A. Represent beat-cues as a Singly Linked List where each ith node contains beat-number which will be played at ith second and a pointer to (i+1)th beat node. Last beat node's next pointer points to null.

B. Given these beat-cues as Linked Lists, he selects a time difference of 't' seconds and reverses t beats at a time from starting.When he reverses first t beats, he moves to next t beats and reverses them,when he reaches to a situation when number of beat nodes remaining is less than 't', he does not reverse them.

e.g If Beat cue is **6->4->5-> 6->7->2 ->1->3->4 ->3->9** and the time difference 't' is 3.

then the output beat-cue will be **5->4->6->2->7->6->4->3->1->3->9.**

Write a Java Program to perform this task.

Input Format: First line contains 'T' total number of test cases. Next 2*T line contains beat-cue and time difference information in given format

First Line contains integer **n** representing length of beat-cue and integer **t**, the time difference.
Second Line contains n space separated beat numbers.

Output Format: Output contains T lines.Each line prints the sequence of beats after performing above given remix operation.

Example -
Input
3
7 2
1 3 4 2 7 6 8
8 1
1 3 2 7 5 0 9 1
10 8

1 2 3 4 5 6 7 8 9 0
Output
3 1 2 4 6 7 8
1 3 2 7 5 0 9 1
8 7 6 5 4 3 2 1 9 0

2. Achieve Maximum Profit:

Rajesh is a thief and always tries to steal the most valuable items to make his profit. One day he comes across a street of N houses and wants to steal the most valuable item from each contiguous group of houses.

Your goal is to write a Java program to help Rajesh achieve the maximum profit from each contiguous group of size k among all the houses. **Expected Complexity:** O(n). (Hint: Try Deque)

Input Format: First line contains 'T' total number of test cases.

For each test case the first line contains integer **N** representing the number of houses in the street and integer **K** which is the size of the subgroup of houses to be considered.

Second Line contains **N** space separated numbers which denote the profit of Rajesh from each house.

Output Format: Output contains T lines. Each line prints the space separated maximum profit from each contiguous subgroup .

Example -
Input
2
6 2
1 3 4 2 7 6
4 3
1 3 2 7
Output
3 4 4 7 7
3 7

3. Find Batman:

Joker is very smart and has found that Bruce Wayne is the Batman. Joker crashes a masquerade party and tries to find Bruce Wayne at the party. However everyone at the party is wearing a mask so the joker cannot recognize him easily. But Bruce Wayne is famous and rich, so everyone knows him at the party but he doesn't know anyone due to his double life.

Your goal is to write a Java Program to find the person number of Bruce Wayne at the party. A square matrix of size P is used to represent people at the masquerade party. If Matrix[i][j] = 1 then it means person "i" knows person "j". **Expected Complexity:** O(P)

Assumptions: All the indexes start from 0. Matrix[i][i] is always 0. There is only one Bruce Wayne. Property of transitivity doesn't apply.

Input Format: The first line contains the size of square matrix **P**. The second line contains P*P space separated integers which contain 0 or 1 depending on whether a person knows someone or not.

Output Format: Person number of Bruce Wayne. In case Bruce Wayne is not at the party print -1.

Example -
Input:
3
0 0 0 1 0 0 1 0 0
Output:
0
Explanation:
Here the 1st and 2nd person knows 0th person and 0th person doesn't know anybody so he is Batman.

Input:
3
0 1 0 1 0 0 1 1 0
Output:
-1
Explanation:
Here everyone knows someone else. So Batman is not at the party.