

Quiz 7: ECS 342/442/642 Competitive Programming

2 pm to 2:55 pm on 10th April, 2025

Instructions

- Please show your code to the invigilator and make sure he makes a note of it.
- Suppose your enrollment number is 20001.
 - Open Linux and create folder `quiz-07-20001`.
 - The folder should contain files `quiz-71-20001.cpp`, `quiz-72-20001.cpp`, and `quiz-73-20001.cpp` corresponding to the following three questions.
 - Zip the folder and upload it at <http://172.28.153.65:5000>
- Your output should use the following line of code.

```
1 int main()  
2 {  
3     int final_output; // or other relevant declaration  
4     cout << '20001\t' << 'Donald Knuth\t' << final_output << endl;  
5     //Replace '20001' by your roll number and 'Donald Knuth' by your name.  
6 }
```

Questions

1. (10 pts) List Removals

You are given a list consisting of n integers. Your task is to remove elements from the list at given positions, and report the removed elements.

Input: The first input line has an integer n : the initial size of the list. During the process, the elements are numbered $1, 2, \dots, k$ where k is the current size of the list. The second line has n integers $x_1, x_2, \dots, x_n$: the contents of the list. The last line has n integers $p_1, p_2, \dots, p_n$: the positions of the elements to be removed.

Output: Print the elements in the order they are removed.

Constraints: The problem has a time limit of 1 second.

2. (10 pts) Tree Diameter

You are given a tree consisting of n nodes. The diameter of a tree is the maximum distance between two nodes. Your task is to determine the diameter of the tree.

Input: The first input line contains an integer n : the number of nodes. The nodes are numbered $1, 2, \dots, n$. Then there are $n - 1$ lines describing the edges. Each line contains two integers a and b : there is an edge between nodes a and b .

Output: Print one integer: the diameter of the tree.

3. (10 pts) **Grid Path**

Consider an $n \times n$ grid whose squares may have traps. It is not allowed to move to a square with a trap. Your task is to calculate the number of paths from the upper-left square to the lower-right square. You can only move right or down.

Input: The first input line has an integer n : the size of the grid. After this, there are n lines that describe the grid. Each line has n integers: 0 denotes an empty cell, and 1 denotes a trap.

Output: Print the number of paths modulo $10^9 + 7$.

Constraints: The problem has a time limit of 2 second.