

## Problem B

### Prüfer Codes

Input File: *pb.in*  
Time Limit: 1 second

#### Problem Description

The Prüfer sequence (or Prüfer code) of a labeled tree is a unique sequence associated with the tree. The sequence for a tree on  $n$  vertices has length  $n-2$ , and can be generated by a simple iterative algorithm. One can generate a labeled tree's Prüfer sequence by iteratively removing vertices from the tree until only two vertices remain. Specifically, consider a labeled tree  $T$  with vertices  $\{1, 2, \dots, n\}$ . At step  $i$ , remove the leaf with the smallest label and set the  $i$ th element of the Prüfer sequence to be the label of this leaf's neighbor.

Consider the above algorithm run on the simple example shown as Figure 1. Initially, vertex 1 is the leaf with the smallest label, so it is removed first and "7" is put in the Prüfer sequence. Vertices 2 and 3 are removed next, so "4" is added twice more. Then, vertex 4 is a leaf and has the smallest label, so it is removed and we append "7" to the sequence. Finally, vertex 6 is now a leaf and has the smallest label, so it is removed and we append "5" to the sequence. We are left with only two vertices, so we stop. The tree's sequence is 74475.

Given a Prüfer sequence, you are asked to decode the sequence to its original labeled tree. For example, see Figure 1 again. The decoded tree of the Prüfer sequence 74475 is as follows:

7	4	4	7	5
1	2	3	4	6

Note that each column in the above representation is an edge of the tree. That is, the numbers in the first column represent edge (7, 1) of the tree.

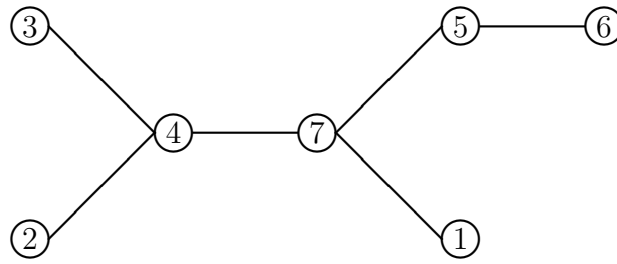


Figure 1: A labeled tree  $T$  of 7 vertices.

Similarly,  $(4, 2)$  and  $(4, 3)$  are two other edges, etc. Note also that the absent edge is edge  $(7, 5)$  which contains number  $n$  and the last number in the Prüfer sequence. If the last number in the Prüfer sequence is  $n$ , then the absent edge will be  $(n, n - 1)$ .

## Input Format

The first line of the input file contains an integer  $m$ ,  $10 \leq m \leq 15$ , which represents the number of test cases. Each test case contains its Prüfer sequence in one line. Note that the length of any Prüfer sequence is less than 20 and there is a blank between two labels in the sequence.

## Output Format

For each test case, output its original tree in two lines. The first line is the Prüfer sequence. For each label in the Prüfer sequence, output its corresponding removed neighbor in order in the second line. Please leave a blank to separate two labels.

## Sample Input

```
2
7 4 4 7 5
3 3
```

## Sample Output

```
7 4 4 7 5
1 2 3 4 6
3 3
1 2
```