ACM International Collegiate Programming Contest 2002–2003

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Southwestern Europe Regional Contest

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Practice Session

University of Porto, Portugal

November 16th, 2002

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Contents

Problem A

Weird Mapping between Words and Integers

Consider the following bijection between words from the alphabet $\{a, b\}$ and the the set of non-negative integers, N:

```
f: {a,b}* -> N
         e -> 0 (empty word)
         a -> 1
         b -> 2
        aa -> 3
        ba -> 4
        ab -> 5
        bb -> 6
       aaa -> 7
       baa -> 8
```

Problem

Your task is to write a program that can transform words from alphabet $\{a, b\}$ with maximum size less than 30 into the corresponding integers and also transform integers into the corresponding words, according to the mapping defined above.

Input

The input consists of a sequence of lines and each line can either be a word from the alphabet or an integer. It is guaranteed that the given integer corresponds to a word of maximum size less than 30. All the words in the input are non-empty and the integers are greater than zero.

Output

For each line of input, a word or an integer, you should output also in separate lines the corresponding integer or word according to the mapping defined above.

Sample Input

```
b
5
aaa
18
```

Sample Output

```
2
ab
7
bbaa
```

Problem B

Rising or Falling Sequences

In *The man who loved only numbers*, Paul Hoffman gives a very absorving memoir of the brilliant number theorist Paul Erdös through the recollections of many of his collaborators, specially the mathematician Ronald L. Graham. One area were Erdös and Graham got very much involved was the Ramsey theory.

Here we take a simpler example of Ramsey theory to pose a challenge to you. Consider the first 101 integers and arrange them in any order you like. No matter the arrangement, you will always be able to find 11 integers that form an increasing or a decreasing sequence. As said by Graham: "You don't have to pick the integers consecutively. You can jump. You might pick the first one, then the thirty-eighth one – but they all have to be going up or going down". This would not necessarily be true if you only had the first 100 integers, as it is possible to give a sequence of those 100 integers such that there is no increasing or decreasing sequence of 11 integers.

Ramsey theory generalizes this result: "to guarantee either a rising or falling sequence of length $n+1$, you need n^2+1 numbers; with n^2 numbers, you may not get it.

Discovering such a sequence is challenging, but we invite you for a slightly bigger challenge, that is, to determine the longest rising (increasing) or falling (decreasing) sequence for a given n. It follows from the above result that the sequence has at least $n+1$ numbers.

Problem

Your task is to write a program to compute the longest rising or falling sequence of integers, given an arrangement of the first n^2+1 integers.

You should always output the longest rising or falling sequence that appears first in the given sequence of numbers. If this rule is not enough to take a decision, then you should output the rising sequence.

Input

The input is composed by the integer value of n ($0 < n \leq 100$) in the first line, followed by n^2+1 different integers, each in a separate line, comprehended between 1 and n^2+1.

Output

Your output should be the first longest rising or falling sequence of integers, from the arrangement given as input, considering the rules above. Each number in the sequence should be printed in a separate line.

Sample Input

```
3
5
6
3
2
9
1
8
4
7
10
```

Sample Output

```
5
6
9
10
```

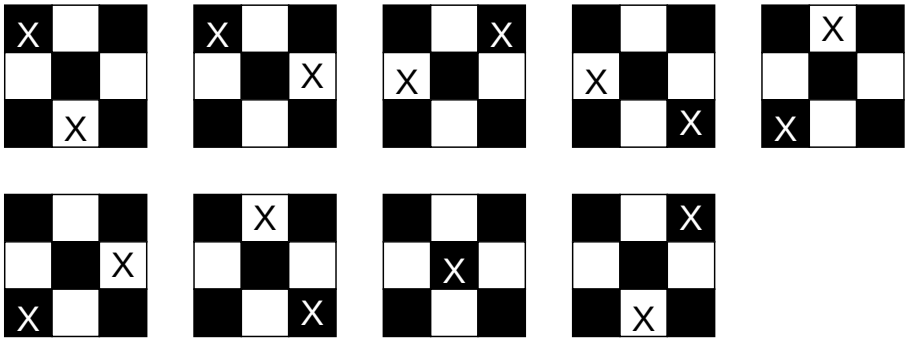
Problem C
Maximally Safe

Problem

You are certainly aware of the famous N-queens problem that consists on finding a safe placement for N queens on a N by N chessboard. We say that a configuration is safe when no queen can attack any other queen on the board.

In this problem your task has been simplified. We request that you determine the maximally safe configurations of queens on a N by N chessboard. A configuration is maximally safe if no queen can be added without the configuration becoming unsafe.

As an example, consider a 3x3 chessboard. In this case there are 9 different maximally safe configurations as illustrated in the following figure:



Input

Input consists of an integer, $N <= 10$, corresponding to the size of the chessboard.

Output

Output consists of an integer corresponding to the number of different maximally safe configurations that exist.

Sample Input

```
3
```

Sample Output

```
9
```