Semester Break Problem Solving Competition

Contest 1

September 15, 2012

Problem A – Bins

There is a large number of empty bins in a factory depot. The bins are arranged in a single row. The manager of the depot wants to put some bins into other bins to make some free space in the left end of the depot. Bins can be moved by a robot, which can take a bin, carry it to the right, and put it into a larger bin. This three-operation sequence is the only allowed way to move bins.

Because of safety regulations, any bin can contain at most one other bin, which must be empty. The manager also wants to keep the double bins in the left end of the resulting row, to make it easier to keep track of them.

You are to write a program that computes the largest possible K such that the K leftmost bins can be put into the immediately following K bins in some order.

INPUT

The first line contains two integers, separated by a space: M ($1 \le M \le 1000$), the size of the largest bin, and N ($1 \le N \le 20{,}000$), the number of bins. The second line contains N integers Ai ($1 \le Ai \le M$), separated by spaces: the sizes of the bins, listed from left to right.

OUTPUT

The first and only line should contain a single integer, the largest number K such that the robot can put the K leftmost bins into the next K bins.

TIME LIMIT 0.1 second

SAMPLE IO

Input	Output
5 10 2 2 1 4 3 2 5 4 2 3	4

Problem 2 – Postar

Mirko has got a mailman job in a small town in the hills. The town can be represented by a N×N matrix. Each field contains one of the following, exclusively: a house denoted by ‘K’, the post office denoted by ‘P’, or a pasture denoted by ‘.’. Additionally, each field is assigned an altitude.

Every morning, Mirko delivers mail to all houses in the town. He starts at the field denoted by ‘P’, which represents a single post office in the town. Mirko is allowed to move horizontally, vertically and diagonally, to adjacent squares only. Once he delivers the last piece of mail, he must return to the post office.

Mirko did not have a clue about how tiresome his job will be. Let the difference between the heights of the highest and the lowest field Mirko visits while delivering the mail be equal to his tiredness. Help him out and determine the least tiredness possible for Mirko to deliver all the mail.

INPUT

The first line of input contains an integer N ($2 \leq N \leq 50$).

The following N lines represent fields in the corresponding matrix row. The character ‘P’ will appear exactly once, while the character ‘K’ will appear at least once.

The following N lines each contain N positive integers, the altitudes of the fields in the corresponding matrix row. Those values are less than 1 000 000.

OUTPUT

In a single line of output print a single integer that represents the minimum possible tiredness.

SAMPLE IO

Input	Input	Input
2 P. .K 2 1 3 2	3 P.. .KK ... 3 2 4 7 4 2 2 3 1	3 K.P ... K.K 3 3 4 9 5 9 8 3 7
Output	Output	Output
0	2	5

First sample description: Starting from the post office, Mirko can move directly to the field with the house, deliver the mail and return back to the post office. Since both the field with the post office and the one with the house have the same altitude, Mirko’s tiredness is equal to zero.

Problem 3 – Kuglice

Mirko and Slavko love playing with marbles. On an exciting Friday, Mirko has come up with a marble game which he wants to show to Slavko.

In the game, Mirko constructs a directional graph in which all vertices have at most at most one outgoing edge. Then he places a marble on one of the vertices. Whenever a marble is on some vertex X, the marble moves to the adjacent vertex connected by a single edge, if such exists. The movement of the marble continues until a vertex with no outgoing edge is visited, where the marble stops. It is also possible that the marble traverses the graph indefinitely in case no such vertex is ever visited.

To make sure that Slavko understand the rules of the game, Mirko will ask a series of queries. The types of queries are as follows:

1 X – unless the marble stucks in a loop, on which vertex will the marble stop if it is placed on the vertex X?
2 X – delete the outgoing edge of the vertex X (it is guaranteed that such edge will always exist)

Note: queries are executed in order and are cummulative (one affects another).

INPUT

The first line contains a postive integer N ($1 \leq N \leq 300\,000$), the number of vertices in the graph.

The second line contains exactly N positive integers separated by a single space, where the number at position i denotes the index of the destination of the outgoing edge from vertex with index i. The zero value represent that there is no outgoing edge from the vertex with index i.

The following line contains a single positive integer Q ($1 \leq Q \leq 300\,000$), the number of queries.

The remaining Q lines contain queries in the format described above.

OUTPUT

For each query of type 1, output the index of the vertex where the marble stops, one per line, in the order of the execution of queries. If the marble never stops, output CIKLUS instead.

SAMPLE IO

Input	Input
3 2 3 1 7 1 1 1 2 2 1 1 2 1 1 2 2 1 2	5 0 3 5 3 4 6 1 1 1 2 2 4 1 2 2 3 1 2
Output	Output
CIKLUS CIKLUS 1 1 2	1 CIKLUS 4 3