

## Problem D

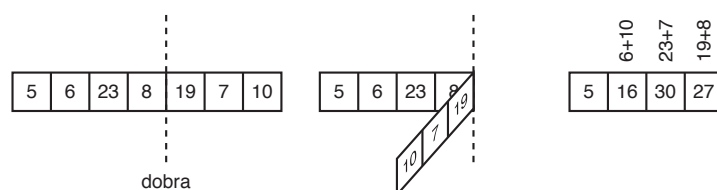
# Folding Machine

*File:* machine. [c|cpp|java]

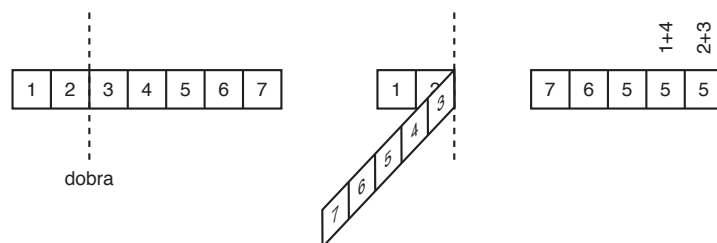
One of the main tools of a Turing machine, which allows its computing power to be bigger than other simpler models, is an infinite tape, divided in cells, where information is stored.

A Folding machine is a machine inspired by a Turing machine. In a Folding machine, the tape is finite, the data are integers and instead of having the functionality of the original Turing machine, this machine uses folding tape operations.

To perform a folding operation, the machine chooses a position between adjacent cells and folds the tape, adding the values of overlapping cells, as can be seen in the figure below.



Notice that the machine can also fold the tape before the tape center, as shown in the next figure. The machine can also choose to fold at the tape start or at the tape end, actually inverting the tape.



Science of Bends Company is developing commercial versions of their Folding machine and its production have recently raised. The last lot produced, unfortunately, have some issues and some machines aren't working properly. Some additional testing is therefore needed, to avoid selling defective machines, which would denigrate the company's image.

To test these machines, a set of tests and tapes are given. For each tape, the machine returns some computation result. Therefore, the engineers responsible for testing take note of the results and can verify if they are correct. But these engineers forgot to take note of which computation was made in each test case.

To avoid re-testing all machines again, the engineers agreed that any combination of foldings is sound and accepted if, from a given input, it generates the expected output. You were hired to develop a program which, given the input and output tapes, determines whether there is a folding sequence that, starting from the input tape, generates the output tape.

### Input

The input contains several test cases. Each test case is composed of four lines. The first two lines refer to the input tape for the Folding machine and the last two lines refer to the output tape. The first line contains a single number,  $N$ , describing the input tape size. The second line contains  $N$  integers  $v_1, \dots, v_N$  describing the content of the input tape. The third line contains a single integer  $M$ , the output tape size; and the fourth line contains  $M$  integers  $w_1, \dots, w_M$ , the content of the output tape.

## Output

For each test case your program must produce a single line, containing a single character, which must be “S” if there is a folding sequence able to generate the output tape starting from the input tape, and “N” otherwise.

## Restrictions

- $1 \leq M \leq N \leq 15$ .
- $0 \leq v_i, w_j \leq 10^8$ , for  $1 \leq i \leq N$  and  $1 \leq j \leq M$ .

## Examples

Input	Output
7	S
5 6 23 8 19 7 10	S
4	S
5 16 30 27	N
7	S
1 2 3 4 5 6 7	S
5	S
7 6 5 5 5	
4	
1 2 3 4	
1	
10	
6	
19 23 3 51 2 0	
2	
34 64	
6	
1 2 3 4 5 6	
6	
1 2 3 4 5 6	
6	
1 2 3 4 5 6	
6	
6 5 4 3 2 1	