South African Computer Olympiad
3rd Training Camp 2011
Training Camp Day 1

Overview

Author(s)	IOI 2011	BOI 2011	BOI 2007
Problem	**hottest**	**lamp**	**sequence**
Source	hottest.c hottest.cpp	lamp.c lamp.cpp	sequence.c sequence.cpp
Input file	stdin	stdin	stdin
Output file	stdout	stdout	stdout
Time limit	1 second	1 second	1 second
Memory limit	64MiB	64MiB	64MiB
Number of tests	10	12	20
Points per test	10	10	5
Detailed feedback	No	No	No
Total points	**100**	**120**	**100**

The maximum total score is 320 points.

https://olympiad.cs.uct.ac.za/contests/camp3-2011/

Hottest

IOI 2011

Introduction

Thailand is a tropical country. Thai people usually say that Thailand has 3 seasons: Hot Summer, Hotter Summer, and Hottest Summer. It especially feels very hot when you have many consecutive days with high temperatures.

The IOI organisers are planning the IOI in Thailand. The IOI will be K contiguous days, with L competition days. Since the organisers would like you to experience the real Thai Summer, they want you free days to be hot as possible.

Task

You are given a list of forecasted temperatures of N consecutive days that the IOI committee is considering hosting the IOI. Your task is to find M, the maximum sum of temperatures over K consecutive days. Note that the L days you spend competing are not included in the sum.

Example

In the example input we have $N = 10$ forecasted temperatures. The IOI will be $K = 6$ days long with $L = 2$ competition days. If the IOI where to start on the 5^{th} day and end on the 10^{th} day we will get he maximum possible $M = 130$. This is since the two competition days will be the 7^{th} and 10^{th} days, leaving the sum to be

$$32 + 32 + 33 + 33 = 130$$

Input (stdin)

The first line contains three integers: N, K and L. The following N lines each contain a single integer: T_i, the temperature on day i.

Sample input

```
10 6 2
32
31
31
32
32
32
30
33
33
27
```

Output (stdout)

The first and only line of the output contains a single integer, M.

Sample Output

```
130
```

Constraints

- $1 \leq N \leq 200\,000$
- $1 \leq L \leq K \leq N$
- $-10\,000 \leq T_i \leq 10\,000$ for all $1 \leq i \leq N$.

Time limit

1 second.

Scoring

A correct solution will score 100% while an incorrect solution will score 0%.

Switch the Lamp On

BOI 2011

Introduction

Casper is designing an electronic circuit on a $N \times M$ rectangular grid plate. There are $N \times M$ square tiles that are aligned to the grid on the plate. Two (out of four) opposite corners of each tile are connected by a wire.

A power source is connected to the top left corner of the plate. A lamp is connected to the bottom right corner of the plate. The lamp is on only if there is a path of wires connecting power source to lamp. In order to switch the lamp on, any number of tiles can be turned by 90 degrees (in both directions).

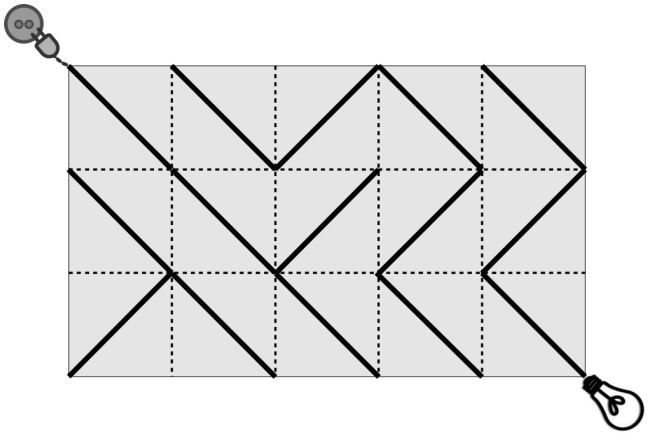

Figure 1: In the picture above the lamp is off. If any one of the tiles in the second column from the right is turned by 90 degrees, power source and lamp get connected, and the lamp is on.

Task

Write a program to nd out the minimal number of tiles that have to be turned by 90 degrees to switch the lamp on.

Example

The sample input is represented in Figure 1. If any one of the tiles in the second column from the right is turned by 90 degrees, power source and lamp get connected, and the lamp is on. So the minimal number of tile rotations is 1.

Input (stdin)

The first line of input contains two integer numbers N and M, the dimensions of the plate. In each of the following N lines there are M symbols - either
or / - which indicate the direction of the wire connecting the opposite vertices of the corresponding tile.

Sample input

```
3 5
\\/\\
\\///
/\\\\
```

Output (stdout)

There must be exactly one line of output. If it is possible to switch the lamp on, this line must contain only one integer number: the minimal number of tiles that have to be turned to switch on the lamp. If it is not possible, output the string: `NO SOLUTION`

Sample Output

```
1
```

Constraints

- $1 \leq N, M \leq 500$

In test cases worth 40 points, $1 \leq N \leq 4$ and $1 \leq M \leq 5$.

Time limit

1 second.

Scoring

A correct solution will score 100% while an incorrect solution will score 0%.

Sequence

BOI 2007

Introduction

We are given a sequence $a_1, \ldots, a_n$. We can manipulate this sequence using the operation $reduce(i)$, which replaces elements a_i and a_{i+1} with a single element $max(a_i, a_{i+1})$, resulting in a new shorter sequence. The cost of this operation is $max(a_i, a_{i+1})$. After $n1$ operations of *reduce*, we obtain a sequence of length 1.

Task

Your task is to compute the cost of the optimal reducing scheme, i.e. the sequence of reduce operations with minimal cost leading to a sequence of length 1.

Example

The example sequence has 3 numbers: $1, 2, 3$. A possible optimal sequence of operations is the following:

Operation	Resulting Sequence	Cost
	$1, 2, 3$	
$reduce(1)$	$2, 3$	2
$reduce(1)$	3	3

This has a total cost of 5, which is the minimal cost to reduce the sequence to one element.

Input (stdin)

The first line of the input contains a single integer, N. The next N lines each contain a single integer, a_i.

Sample input

```
3
1
2
3
```

Output (stdout)

In the first and only line of the output prints the minimal cost of reducing the sequence to a single element.

Sample Output

```
5
```

Constraints

- $1 \leq N \leq 100\,000$
- $0 \leq a_i \leq 1\,000\,000$

Additionally in 30% of the test cases $n \leq 500$ holds.

Time limit

1 second.

Scoring

A correct solution will score 100% while an incorrect solution will score 0%.