Codeforces Round #178 (Div. 2)

A. Shaass and Oskols

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

Shaass has decided to hunt some birds. There are n horizontal electricity wires aligned parallel to each other. Wires are numbered 1 to n from top to bottom. On each wire there are some oskols sitting next to each other. Oskol is the name of a delicious kind of birds in Shaass's territory. Supposed there are a_i oskols sitting on the i-th wire.

Sometimes Shaass shots one of the birds and the bird dies (suppose that this bird sat at the i-th wire). Consequently all the birds on the i-th wire to the left of the dead bird get scared and jump up on the wire number $i - 1$, if there exists no upper wire they fly away. Also all the birds to the right of the dead bird jump down on wire number $i + 1$, if there exists no such wire they fly away.

Shaass has shot m birds. You're given the initial number of birds on each wire, tell him how many birds are sitting on each wire after the shots.

Input

The first line of the input contains an integer n, $(1 \le n \le 100)$. The next line contains a list of space-separated integers $a_1, a_2, ..., a_n$, $(0 \le a_i \le 100)$.

The third line contains an integer m, $(0 \le m \le 100)$. Each of the next m lines contains two integers x_i and y_i. The integers mean that for the i-th time Shaass shoot the y_i-th (from left) bird on the x_i-th wire, $(1 \le x_i \le n, 1 \le y_i)$. It's guaranteed there will be at least y_i birds on the x_i-th wire at that moment.

Output

On the i-th line of the output print the number of birds on the i-th wire.

Examples

input
5 10 10 10 10 10 5 2 5 3 13 2 12 1 13 4 6
output
0 12 5 0 16

input
3 2 4 1 1 2 2
output
3 0 3

B. Shaass and Bookshelf

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

Shaass has n books. He wants to make a bookshelf for all his books. He wants the bookshelf's dimensions to be as small as possible. The thickness of the i-th book is t_i and its pages' width is equal to w_i. The thickness of each book is either 1 or 2. All books have the same page heights.

Shaass puts the books on the bookshelf in the following way. First he selects some of the books and put them vertically. Then he puts the rest of the books horizontally above the vertical books. The sum of the widths of the horizontal books must be no more than the total thickness of the vertical books. A sample arrangement of the books is depicted in the figure.

Help Shaass to find the minimum total thickness of the vertical books that we can achieve.

Input

The first line of the input contains an integer n, $(1 \le n \le 100)$. Each of the next n lines contains two integers t_i and w_i denoting the thickness and width of the i-th book correspondingly, $(1 \le t_i \le 2, 1 \le w_i \le 100)$.

Output

On the only line of the output print the minimum total thickness of the vertical books that we can achieve.

Examples

input
5 1 12 1 3 2 15 2 5 2 1
output
5

input
3 1 10 2 1 2 4
output
3

C. Shaass and Lights

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

There are n lights aligned in a row. These lights are numbered 1 to n from left to right. Initially some of the lights are switched on. Shaass wants to switch all the lights on. At each step he can switch a light on (this light should be switched off at that moment) if there's at least one adjacent light which is already switched on.

He knows the initial state of lights and he's wondering how many different ways there exist to switch all the lights on. Please find the required number of ways modulo 1000000007 $(10^9 + 7)$.

Input

The first line of the input contains two integers n and m where n is the number of lights in the sequence and m is the number of lights which are initially switched on, $(1 \le n \le 1000, 1 \le m \le n)$. The second line contains m distinct integers, each between 1 to n inclusive, denoting the indices of lights which are initially switched on.

Output

In the only line of the output print the number of different possible ways to switch on all the lights modulo 1000000007 $(10^9 + 7)$.

Examples

input
3 1 1
output
1

input
4 2 1 4
output
2

input
11 2 4 8
output
6720

D. Shaass and Painter Robot

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

Shaass thinks a kitchen with all white floor tiles is so boring. His kitchen floor is made of $n \cdot m$ square tiles forming a $n \times m$ rectangle. Therefore he's decided to color some of the tiles in black so that the floor looks like a checkerboard, which is no two side-adjacent tiles should have the same color.

Shaass wants to use a painter robot to color the tiles. In the beginning the robot is standing in a border tile (x_s, y_s) facing a diagonal direction (i.e. upper-left, upper-right, down-left or down-right). As the robot walks in the kitchen he paints every tile he passes even if it's painted before. Painting each tile consumes one unit of black paint. If at any moment the robot hits a wall of the kitchen he changes his direction according the reflection rules. Note that a tile gets painted when the robot enters the tile from another tile, in other words changing direction in the same tile doesn't lead to any painting. The first tile the robot is standing on, is also painted.

The robot stops painting the first moment the floor is checkered. Given the dimensions of the kitchen and the position of the robot, find out the amount of paint the robot consumes before it stops painting the floor.

Let's consider an examples depicted below.

If the robot starts at tile number 1 (the tile $(1, 1)$) of the left grid heading to down-right it'll pass tiles 1354236 and consumes 7 units of black paint on his way until he stops at tile number 6. But if it starts at tile number 1 in the right grid heading to down-right it will get stuck in a loop painting tiles 1, 2, and 3.

Input

The first line of the input contains two integers n and m, $(2 \le n, m \le 10^5)$. The second line contains two integers x_s and y_s $(1 \le x_s \le n, 1 \le y_s \le m)$ and the direction robot is facing initially. Direction is one of the strings: "UL" (upper-left direction), "UR" (upper-right), "DL" (down-left) or "DR" (down-right).

Note, that record (x_s, y_s) denotes the tile that is located at the x_s-th row from the top and at the y_s-th column from the left of the kitchen.

It's guaranteed that the starting position will be a border tile (a tile with less than four side-adjacent tiles).

Output

Print the amount of paint the robot consumes to obtain a checkered kitchen floor. Or print `-1` if it never happens.

Please do not use the `%lld` specificator to read or write 64-bit integers in C++. It is preferred to use the `cin`, `cout` streams or the `%I64d` specificator.

Examples

input
3 4 1 1 DR
output
7

input
3 4 3 3 DR
output
11

input
3 3 1 1 DR
output
-1

input
3 3 1 2 DL
output
4

E. Shaass the Great

time limit per test: 4 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

The great Shaass is the new king of the Drakht empire. The empire has n cities which are connected by $n - 1$ bidirectional roads. Each road has an specific length and connects a pair of cities. There's a unique simple path connecting each pair of cities.

His majesty the great Shaass has decided to tear down one of the roads and build another road with the same length between some pair of cities. He should build such road that it's still possible to travel from each city to any other city. He might build the same road again.

You as his advisor should help him to find a way to make the described action. You should find the way that minimize the total sum of pairwise distances between cities after the action. So calculate the minimum sum.

Input

The first line of the input contains an integer n denoting the number of cities in the empire, $(2 \le n \le 5000)$. The next $n - 1$ lines each contains three integers a_i, b_i and w_i showing that two cities a_i and b_i are connected using a road of length w_i, $(1 \le a_i, b_i \le n, a_i \ne b_i, 1 \le w_i \le 10^6)$.

Output

On the only line of the output print the minimum pairwise sum of distances between the cities.

Please do not use the `%lld` specificator to read or write 64-bit integers in C++. It is preferred to use the `cin`, `cout` streams or the `%I64d` specificator.

Examples

input
3 1 2 2 1 3 4
output
12

input
6 1 2 1 2 3 1 3 4 1 4 5 1 5 6 1
output
29

input
6 1 3 1 2 3 1 3 4 100 4 5 2 4 6 1
output
825