A

Data Center

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

You are developing a project to build a new data center. The data center will be a rectangle with an area of exactly n square meters. Each side of the data center must be an integer.

Your goal is to minimize the impact of the external environment on the data center. For this reason, you want to minimize the length of the perimeter of the data center (that is, the sum of the lengths of its four sides).

What is the minimum perimeter of a rectangular data center with an area of exactly n square meters, if the lengths of all its sides must be integers?

Input

The first and only line of the input contains an integer n ($1 \le n \le 10^5$), where n is the area of the data center in square meters.

Output

Print the required minimum perimeter in meters.

Examples

input
36
output
24

input
13
output
28

input
1
output
4

Note

In the first example, the required shape of the data center is 6×6 square. Its area is 36 and the perimeter is $6 + 6 + 6 + 6 = 24$.

In the second example, the required shape of the data center is 1×13 rectangle. Its area is 13 and the perimeter is $1 + 13 + 1 + 13 = 28$.

In the third example, the required shape of the data center is 1×1 square. Its area is 1 and the perimeter is $1 + 1 + 1 + 1 = 4$.

B Businessmen Problems

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

Two famous competing companies *ChemForces* and *TopChemist* decided to show their sets of recently discovered chemical elements on an exhibition. However they know that no element should be present in the sets of both companies.

In order to avoid this representatives of both companies decided to make an agreement on the sets the companies should present. The sets should be chosen in the way that maximizes the total income of the companies.

All elements are enumerated with integers. The *ChemForces* company has discovered n distinct chemical elements with indices $a_1, a_2, \ldots, a_n$, and will get an income of x_i Berland rubles if the i-th element from this list is in the set of this company.

The *TopChemist* company discovered m distinct chemical elements with indices $b_1, b_2, \ldots, b_m$, and it will get an income of y_j Berland rubles for including the j-th element from this list to its set.

In other words, the first company can present any subset of elements from $\{a_1, a_2, \ldots, a_n\}$ (possibly empty subset), the second company can present any subset of elements from $\{b_1, b_2, \ldots, b_m\}$ (possibly empty subset). There shouldn't be equal elements in the subsets.

Help the representatives select the sets in such a way that no element is presented in both sets and the total income is the maximum possible.

Input

The first line contains a single integer n ($1 \le n \le 10^5$) — the number of elements discovered by *ChemForces*.

The i-th of the next n lines contains two integers a_i and x_i ($1 \le a_i \le 10^9, 1 \le x_i \le 10^9$) — the index of the i-th element and the income of its usage on the exhibition. It is guaranteed that all a_i are distinct.

The next line contains a single integer m ($1 \le m \le 10^5$) — the number of chemicals invented by *TopChemist*.

The j-th of the next m lines contains two integers b_j and y_j, ($1 \le b_j \le 10^9, 1 \le y_j \le 10^9$) — the index of the j-th element and the income of its usage on the exhibition. It is guaranteed that all b_j are distinct.

Output

Print the maximum total income you can obtain by choosing the sets for both companies in such a way that no element is presented in both sets.

Examples

input
3 1 2 7 2 3 10 4 1 4 2 4 3 4 4 4

output
24

input

```
1
1000000000 239
3
14 15
92 65
35 89
```

output

```
408
```

Note

In the first example *ChemForces* can choose the set $(3, 7)$, while *TopChemist* can choose ($1, 2, 4$). This way the total income is $(10 + 2) + (4 + 4 + 4) = 24$.

In the second example *ChemForces* can choose the only element 10^9, while *TopChemist* can choose $(14, 92, 35)$. This way the total income is $(239) + (15 + 65 + 89) = 408$.

C Appleman and Tree

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

Appleman has a tree with n vertices. Some of the vertices (at least one) are colored black and other vertices are colored white.

Consider a set consisting of k $(0 \le k < n)$ edges of Appleman's tree. If Appleman deletes these edges from the tree, then it will split into $(k + 1)$ parts. Note, that each part will be a tree with colored vertices.

Now Appleman wonders, what is the number of sets splitting the tree in such a way that each resulting part will have exactly one black vertex? Find this number modulo 1000000007 $(10^9 + 7)$.

Input

The first line contains an integer n $(2 \le n \le 10^5)$ — the number of tree vertices.

The second line contains the description of the tree: $n - 1$ integers $p_0, p_1, ..., p_{n-2}$ $(0 \le p_i \le i)$. Where p_i means that there is an edge connecting vertex $(i + 1)$ of the tree and vertex p_i. Consider tree vertices are numbered from 0 to $n - 1$.

The third line contains the description of the colors of the vertices: n integers $x_0, x_1, ..., x_{n-1}$ (x_i is either 0 or 1). If x_i is equal to 1, vertex i is colored black. Otherwise, vertex i is colored white.

Output

Output a single integer — the number of ways to split the tree modulo 1000000007 $(10^9 + 7)$.

Examples

input
3 0 0 0 1 1
output
2

input
6 0 1 1 0 4 1 1 0 0 1 0
output
1

input
10 0 1 2 1 4 4 4 0 8 0 0 0 1 0 1 1 0 0 1
output
27

D Depression

time limit per test: 1 second
memory limit per test: 256 megabytes
input: standard input
output: standard output

Do you remember a kind cartoon "Beauty and the Beast"? No, no, there was no firing from machine guns or radiation mutants time-travels!

There was a beauty named Belle. Once she had violated the Beast's order and visited the West Wing. After that she was banished from the castle...

Everybody was upset. The beautiful Belle was upset, so was the Beast, so was Lumiere the candlestick. But the worst thing was that Cogsworth was upset. Cogsworth is not a human, but is the mantel clock, which was often used as an alarm clock.

Due to Cogsworth's frustration all the inhabitants of the castle were in trouble: now they could not determine when it was time to drink morning tea, and when it was time for an evening stroll.

Fortunately, deep in the basement are lying digital clock showing the time in the format `HH:MM`. Now the residents of the castle face a difficult task. They should turn Cogsworth's hour and minute mustache hands in such a way, that Cogsworth began to show the correct time. Moreover they need to find turn angles in degrees for each mustache hands. The initial time showed by Cogsworth is `12:00`.

You can only rotate the hands forward, that is, as is shown in the picture:

As since there are many ways too select such angles because of full rotations, choose the smallest angles in the right (non-negative) direction.

Note that Cogsworth's hour and minute mustache hands move evenly and continuously. Hands are moving independently, so when turning one hand the other hand remains standing still.

Input

The only line of input contains current time according to the digital clock, formatted as `HH:MM` ($00 \le$ `HH` $\le 23, 00 \le$ `MM` ≤ 59). The mantel clock initially shows `12:00`.

Pretests contain times of the beginning of some morning TV programs of the Channel One Russia.

Output

Print two numbers x and y — the angles of turning the hour and minute hands, respectively ($0 \le x, y < 360$). The absolute or relative error in the answer should not exceed 10^{-9}.

Examples

input
12:00
output
0 0

input
04:30
output
135 180

input
08:17
output
248.5 102

Note

A note to the second example: the hour hand will be positioned exactly in the middle, between 4 and 5.

E Restaurant

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

A restaurant received n orders for the rental. Each rental order reserve the restaurant for a continuous period of time, the i-th order is characterized by two time values — the start time l_i and the finish time r_i ($l_i \le r_i$).

Restaurant management can accept and reject orders. What is the maximal number of orders the restaurant can accept?

No two accepted orders can intersect, i.e. they can't share even a moment of time. If one order ends in the moment other starts, they can't be accepted both.

Input

The first line contains integer number n ($1 \le n \le 5 \cdot 10^5$) — number of orders. The following n lines contain integer values l_i and r_i each ($1 \le l_i \le r_i \le 10^9$).

Output

Print the maximal number of orders that can be accepted.

Examples

input
2 7 11 4 7

output
1

input
5 1 2 2 3 3 4 4 5 5 6

output
3

input
6 4 8 1 5 4 7 2 5 1 3 6 8

output
2

Server time: Jul/17/2020 03:05:22 (i3).
Desktop version, switch to mobile version.
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F. Mr. Bender and Square

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

Mr. Bender has a digital table of size $n \times n$, each cell can be switched on or off. He wants the field to have at least c switched on squares. When this condition is fulfilled, Mr Bender will be happy.

We'll consider the table rows numbered from top to bottom from 1 to n, and the columns — numbered from left to right from 1 to n. Initially there is exactly one switched on cell with coordinates (x, y) (x is the row number, y is the column number), and all other cells are switched off. Then each second we switch on the cells that are off but have the side-adjacent cells that are on.

For a cell with coordinates (x, y) the side-adjacent cells are cells with coordinates $(x - 1, y)$, $(x + 1, y)$, $(x, y - 1)$, $(x, y + 1)$.

In how many seconds will Mr. Bender get happy?

Input

The first line contains four space-separated integers n, x, y, c $(1 \le n, c \le 10^9; 1 \le x, y \le n; c \le n^2)$.

Output

In a single line print a single integer — the answer to the problem.

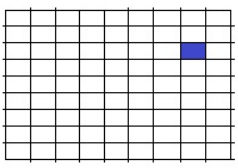
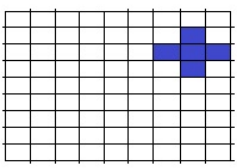
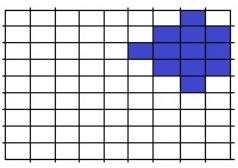
Examples

input
6 4 3 1
output
0

input
9 3 8 10
output
2

Note

Initially the first test has one painted cell, so the answer is 0. In the second test all events will go as is shown on the figure.

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G Maximum Distance

time limit per test: 1 second
memory limit per test: 256 megabytes
input: standard input
output: standard output

Chouti was tired of the tedious homework, so he opened up an old programming problem he created years ago.

You are given a connected undirected graph with n vertices and m weighted edges. There are k special vertices: $x_1, x_2, \ldots, x_k$.

Let's define the cost of the path as the **maximum** weight of the edges in it. And the *distance* between two vertexes as the **minimum** cost of the paths connecting them.

For each special vertex, find another special vertex which is farthest from it (in terms of the previous paragraph, i.e. the corresponding *distance* is maximum possible) and output the distance between them.

The original constraints are really small so he thought the problem was boring. Now, he raises the constraints and hopes you can solve it for him.

Input

The first line contains three integers n, m and k ($2 \le k \le n \le 10^5$, $n - 1 \le m \le 10^5$) — the number of vertices, the number of edges and the number of special vertices.

The second line contains k distinct integers $x_1, x_2, \ldots, x_k$ ($1 \le x_i \le n$).

Each of the following m lines contains three integers u, v and w ($1 \le u, v \le n, 1 \le w \le 10^9$), denoting there is an edge between u and v of weight w. The given graph is undirected, so an edge (u, v) can be used in the both directions.

The graph may have multiple edges and self-loops.

It is guaranteed, that the graph is connected.

Output

The first and only line should contain k integers. The i-th integer is the distance between x_i and the farthest special vertex from it.

Examples

input
2 3 2 2 1 1 2 3 1 2 2 2 2 1
output
2 2

input
4 5 3 1 2 3 1 2 5 4 2 1 2 3 2 1 4 4 1 3 3
output

```
3 3 3
```

Note

In the first example, the distance between vertex 1 and 2 equals to 2 because one can walk through the edge of weight 2 connecting them. So the distance to the farthest node for both 1 and 2 equals to 2.

In the second example, one can find that distance between 1 and 2, distance between 1 and 3 are both 3 and the distance between 2 and 3 is 2.

The graph may have multiple edges between and self-loops, as in the first example.

H Name Quest

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

A Martian boy is named s — he has got this name quite recently from his parents for his coming of age birthday. Now he enjoys looking for his name everywhere. If he sees that he can obtain his name from some string by removing zero or more letters (at that, the remaining letters remain in the same order), he gets happy. For example, if s=«aba», then strings «baobab», «aabbaa», «helloabahello» make him very happy and strings «aab», «baaa» and «helloabhello» do not.

However rather than being happy once, he loves twice as much being happy twice! So, when he got string t as a present, he wanted to cut it in two parts (the left part and the right part) so that each part made him happy.

Help s determine the number of distinct ways to cut the given string t into two parts in the required manner.

Input

The first line contains string s, consisting of lowercase English letters. The length of string s is from 1 to 1000 letters.

The second line contains string t, that also consists of lowercase English letters. The length of string t is from 1 to 10^6 letters.

Output

Print the sought number of ways to cut string t in two so that each part made s happy.

Examples

input
aba baobababbah

output
2

input
mars sunvenusearthmarsjupitersaturnuranusneptune

output
0

ITMO UNIVERSITY

I Palindromic Twist

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

You are given a string s consisting of n lowercase Latin letters. n is even.

For each position i ($1 \le i \le n$) in string s you are required to change the letter on this position either to the previous letter in alphabetic order or to the next one (letters 'a' and 'z' have only one of these options). Letter in every position must be changed **exactly once**.

For example, letter 'p' should be changed either to 'o' or to 'q', letter 'a' should be changed to 'b' and letter 'z' should be changed to 'y'.

That way string "codeforces", for example, can be changed to "dpedepqbft" ('c' → 'd', 'o' → 'p', 'd' → 'e', 'e' → 'd', 'f' → 'e', 'o' → 'p', 'r' → 'q', 'c' → 'b', 'e' → 'f', 's' → 't').

String s is called a palindrome if it reads the same from left to right and from right to left. For example, strings "abba" and "zz" are palindromes and strings "abca" and "zy" are not.

Your goal is to check if it's possible to make string s a palindrome by applying the aforementioned changes to every position. Print "YES" if string s can be transformed to a palindrome and "NO" otherwise.

Each testcase contains several strings, for each of them you are required to solve the problem separately.

Input

The first line contains a single integer T ($1 \le T \le 50$) — the number of strings in a testcase.

Then $2T$ lines follow — lines $(2i - 1)$ and $2i$ of them describe the i-th string. The first line of the pair contains a single integer n ($2 \le n \le 100$, n is even) — the length of the corresponding string. The second line of the pair contains a string s, consisting of n lowercase Latin letters.

Output

Print T lines. The i-th line should contain the answer to the i-th string of the input. Print "YES" if it's possible to make the i-th string a palindrome by applying the aforementioned changes to every position. Print "NO" otherwise.

Example

input
5 6 abccba 2 cf 4 adfa 8 abaazaba 2 ml

output
YES NO YES NO NO

Note

The first string of the example can be changed to "bcbbcb", two leftmost letters and two rightmost letters got changed to the next letters, two middle letters got changed to the previous letters.

The second string can be changed to "be", "bg", "de", "dg", but none of these resulting strings are palindromes.

The third string can be changed to "beeb" which is a palindrome.

The fifth string can be changed to "lk", "lm", "nk", "nm", but none of these resulting strings are palindromes. Also note that no letter can remain the same, so you can't obtain strings "ll" or "mm".

A. The New Year: Meeting Friend

time limit per test: 1 second
memory limit per test: 256 megabytes
input: standard input
output: standard output

There are three friend living on the straight line Ox in Lineland. The first friend lives at the point x_1, the second friend lives at the point x_2, and the third friend lives at the point x_3. They plan to celebrate the New Year together, so they need to meet at one point. What is the minimum total distance they have to travel in order to meet at some point and celebrate the New Year?

It's guaranteed that the optimal answer is always integer.

Input

The first line of the input contains three **distinct** integers x_1, x_2 and x_3 ($1 \le x_1, x_2, x_3 \le 100$) — the coordinates of the houses of the first, the second and the third friends respectively.

Output

Print one integer — the minimum total distance the friends need to travel in order to meet together.

Examples

input
7 1 4
output
6

input
30 20 10
output
20

Note

In the first sample, friends should meet at the point 4. Thus, the first friend has to travel the distance of 3 (from the point 7 to the point 4), the second friend also has to travel the distance of 3 (from the point 1 to the point 4), while the third friend should not go anywhere because he lives at the point 4.

K Case of Fugitive

time limit per test: 3 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

Andrewid the Android is a galaxy-famous detective. He is now chasing a criminal hiding on the planet Oxa-5, the planet almost fully covered with water.

The only dry land there is an archipelago of n narrow islands located in a row. For more comfort let's represent them as non-intersecting segments on a straight line: island i has coordinates $[l_i, r_i]$, besides, $r_i < l_{i+1}$ for $1 \le i \le n - 1$.

To reach the goal, Andrewid needs to place a bridge between each pair of **adjacent** islands. A bridge of length a can be placed between the i-th and the $(i+1)$-th islads, if there are such coordinates of x and y, that $l_i \le x \le r_i$, $l_{i+1} \le y \le r_{i+1}$ and $y - x = a$.

The detective was supplied with m bridges, each bridge can be used at most once. Help him determine whether the bridges he got are enough to connect each pair of adjacent islands.

Input

The first line contains integers n ($2 \le n \le 2 \cdot 10^5$) and m ($1 \le m \le 2 \cdot 10^5$) — the number of islands and bridges.

Next n lines each contain two integers l_i and r_i ($1 \le l_i \le r_i \le 10^{18}$) — the coordinates of the island endpoints.

The last line contains m **integer** numbers $a_1, a_2, ..., a_m$ ($1 \le a_i \le 10^{18}$) — the lengths of the bridges that Andrewid got.

Output

If it is impossible to place a bridge between each pair of adjacent islands in the required manner, print on a single line "No" (without the quotes), otherwise print in the first line "Yes" (without the quotes), and in the second line print $n - 1$ numbers $b_1, b_2, ..., b_{n-1}$, which mean that between islands i and $i + 1$ there must be used a bridge number b_i.

If there are multiple correct answers, print any of them. Note that in this problem it is necessary to print "Yes" and "No" in correct case.

Examples

input
4 4 1 4 7 8 9 10 12 14 4 5 3 8
output
Yes 2 3 1

input
2 2 11 14 17 18 2 9
output

```
No
```

input
2 1 1 1 1000000000000000000 1000000000000000000 999999999999999999
output
Yes 1

Note

In the first sample test you can, for example, place the second bridge between points 3 and 8, place the third bridge between points 7 and 10 and place the first bridge between points 10 and 14.

In the second sample test the first bridge is too short and the second bridge is too long, so the solution doesn't exist.

Number Busters

time limit per test: 1 second
memory limit per test: 256 megabytes
input: standard input
output: standard output

Arthur and Alexander are number busters. Today they've got a competition.

Arthur took a group of four integers a, b, w, x $(0 \le b < w, 0 < x < w)$ and Alexander took integer c. Arthur and Alexander use distinct approaches to number bustings. Alexander is just a regular guy. Each second, he subtracts one from his number. In other words, he performs the assignment: $c = c - 1$. Arthur is a sophisticated guy. Each second Arthur performs a complex operation, described as follows: if $b \ge x$, perform the assignment $b = b - x$, if $b < x$, then perform two consecutive assignments $a = a - 1$; $b = w - (x - b)$.

You've got numbers a, b, w, x, c. Determine when Alexander gets ahead of Arthur if both guys start performing the operations at the same time. Assume that Alexander got ahead of Arthur if $c \le a$.

Input

The first line contains integers a, b, w, x, c
$(1 \le a \le 2 \cdot 10^9, 1 \le w \le 1000, 0 \le b < w, 0 < x < w, 1 \le c \le 2 \cdot 10^9)$.

Output

Print a single integer — the minimum time in seconds Alexander needs to get ahead of Arthur. You can prove that the described situation always occurs within the problem's limits.

Examples

input
4 2 3 1 6
output
2

input
4 2 3 1 7
output
4

input
1 2 3 2 6
output
13

input
1 1 2 1 1
output
0

Server time: Jul/17/2020 03:07:48 (i3).
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