Problem 1. Ski race

Input file:	`input.txt`
Output file:	`output.txt`
Time limit:	1 second
Memory limit:	256 megabytes

Winter has come to the town of N, and it's time for the first cross-country skiing race. This year, participants registered through the Internet — they entered their data, and each picked a number which had not yet been picked by other skiers. Due to the high number of participants, the organizers decided to split the race into several starts. To pick the lucky skiers for the first start, they've come up with a simple rule — the skier with the number X comes to the start if no other skier's number is divisible by X.

Help the organizers write a program to define the numbers of those who will start first.

Input

The first line of the input file contains an integer K — the number of registered participants ($1 \le K \le 10^5$). The second line contains K space-separated integers A_i — the numbers chosen by the participants at the registration ($1 \le A_i \le 10^7$). All the numbers A_i are distinct.

Output

The output file must contain a single line containing the numbers of all participants starting first, in the ascending order. Numbers must be space-separated.

Example

input.txt	output.txt
3 4 8 12	8 12

Problem 2. Chairs

Input file:	`input.txt`
Output file:	`output.txt`
Time limit:	1 second
Memory limit:	256 megabytes

Ostap and Kisa found themselves at a chair sale. They are facing two problems. First, they must leave the sale as soon as possible, because their rival company, represented by father Theodore, is breathing down their necks; second, they must get all chairs at the sale.

The sale site is a rectangular table of N rows and M columns, with some of its cells occupied by chairs that need to be collected. Initially our enterpreneurs are in the top-left corner — the cell with the coordinates $(1, 1)$, and the exit is located in the bottom-right corner — the cell with the coordinates (N, M). A single move can transfer them from a given sell to any of adjacent by a side cells. Passing through a cell with a chair, they take the chair with them. Find a shortest path from the starting to the ending cell. Among all such paths, find one passing through all cells with chairs, or find out if such a path doesn't exist.

Input

The first line contains three integers: N, M, K — size of the table and the number of chairs, respectively ($2 \leq N, M \leq 100$, $0 \leq K \leq 1000$).

The following K lines of the input data each contain two integers: X_i — the number of the row in which the i-th chair is located, and Y_i — the number of the column in which the i-th chair is located ($1 \leq X_i \leq N$, $1 \leq Y_i \leq M$). A single cell cannot contain multiple chairs.

Output

If collecting all chairs along any single shortest path is impossible, print a single word «`Impossible`» (without brackets) in the output file.

If such a path exists, print it as a line containing the sequence of moves, with each move coded by a single symbol according to the following:

- `R` — move right;
- `D` — move down;

If several solutions are possible, print the lexicographically smallest solution.

Example

input.txt	output.txt

3 3 2
1 2
3 3
	RDDR

3 3 2
1 2
2 1
	Impossible

Problem 3. Triangle

Input file:	`stdin`
Output file:	`stdout`
Time limit:	1 second
Memory limit:	256 megabytes

Since Koreyko having vanished treacherously with the sacred suitcase, Ostap is facing a nearly hopeless problem — locate Koreyko with at least some approximation.

It is known that the search area is a triangle on a plane with integers coordinates. To find the coordinates of the vertices, Ostap sends a weird telegram (a, b, c) to the Financial Committee and gets a similarly strange reply (p, q). In reality, the three numbers from Ostap's telegram are coefficients of the line equation $a \cdot x + b \cdot y = c$, and the reply is the proportion of area in which this line cuts the triangle into pieces.

It is known that all vertex coordinates are integers no greater than 1 000 in absolute value. Moreover, the triangle is non-degenerate, and all angles are greater than 5 degrees.

Interaction protocol

This is an interactive problem, and instead of file input-output you'll have to work with a special program — the interactor. Interacting with the program is performed via the standard input-output streams.

Your program will be sending queries and the interactor will be replaying to them. For each query that contains coefficients of the line equation you will receive a reply with the proportion in which the given line cuts the triangle.

Once the answer is printed, the participant's solution must terminate.

Find the vertex coordinates in no more than 1 000 queries. If you cannot print the coordinates or print them incorrectly, you will receive the Wrong Answer verdict.

Output

Ostap's query format: "`?` a b c", where a, b, c are coefficients of the equation of line. These numbers are real numbers with no more than 15 digits after the decimal point ($|a|, |b| \le 2 \cdot 10^3$, $|c| \le 4 \cdot 10^6$, $\frac{1}{4 \cdot 10^6} \le a^2 + b^2 \le 4 \cdot 10^6$).

Problem answer format: "`!` x_1 y_1 x_2 y_2 x_3 y_3", where x_i, y_i are integer coordinates of the required triangle vertices. The three triangle vertices can be written in any order.

Make sure that each query ends with a line break and that you flush the output stream buffer (the `flush` command of the language). Otherwise the solution may get the Deadlock verdict (process execution exceeded the real time limit).

Input

Financial Committee answer format: "p q", where the real numbers p and q define the proportion in which the given line cuts the triangle ($0 \le p, q \le 1$, $p + q = 1$). The number p equals to the part of the triangle area, for which the inequality $a \cdot x + b \cdot y \le c$ holds. The real numbers p and q are printed with 15 digits after the decimal point.

Example

stdin

`? 0 1 0`
`? 0 2 1`
`? 0 1 0`
`? 1 0 1`
`? 0 3 1`
`? 2 0 1`
`? 2 0 3`
`! 0 0 2 0 1 1`

stdout

`0.000000000000000 1.000000000000000`
`0.750000000000000 0.250000000000000`
`0.000000000000000 1.000000000000000`
`0.500000000000000 0.500000000000000`
`0.555555555555555 0.444444444444445`
`0.125000000000000 0.875000000000000`
`0.875000000000000 0.125000000000000`

Problem 4. Wires

Input file:	`input.txt`
Output file:	`output.txt`
Time limit:	1 second
Memory limit:	256 megabytes

Employees of a very large and very secret agancy work in a large rectangular room. N employees from the first division are seated by the windows of one wall and the same number of employees from the second division are seated along the opposite wall. One day, a very important and very secret memo came in — computers of all employees of the two divisions were to be connected in such a manner that each first division employee's computer were linked with the corresponding second division employee's computer with a separate wire.

A technical assignment including the room blueprints was drafted. This blueprints showed the room as a A by B rectangle: its left and right sides are of the length A, and the top and bottom sides are of the length B. There are N input contacts on the left wall, corresponding to positions of computers of the first division employees, and N output contacts on the right side for computers of the second division employees. Connect each input with the corresponding output by a wire based on the mutually unambiguous input-output correspondence.

There are rules regarding wires:

1. Wires cannot fork, i.e. each wire begins at the input contact and ends at the output contact.
2. Each wire can pass both inside and outside the rectangle (all contacts are accessible from both sides of the rectangle wall).
3. A wire **cannot** cross the rectangle wall.
4. Wires **cannot** intersect with each other, i.e. a wire cannot go above another one.

Find the minimum total length of wire necessary to connect the contacts in the desired manner, if it is possible. The wire thickness can be considered negligibly small: wires can pass infinitely close to each other.

Write a program which calculates the minimum required length of wires.

Input

The first line of the input file contains three integers: A — the length of the left side of the rectangle, B — the length of the upper side of the rectangle and N — the number of input (and output) contacts ($1 \le A, B \le 10^8$, $1 \le N \le 10^5$).

The second line describes the positions of all N input contacts. For each k-th input number an integer L_k is given — the distance from the lower left corner of the rectangle to the contact ($0 \le L_k \le A$). It is guaranteed that all L_k are different.

The third line contains the positions of N output contacts. For each k-th output contact an integer R_k is provided — the distance from the lower right corner to the contact ($0 \le R_k \le A$). It is guaranteed that all R_k are different.

Connect each k-th (description-wise) input contact with the k-th (description-wise) output contact.

Output

The first line of the output file must contain a single real number — the minimum total length of all wires in a correct connection scheme. The absolute or relative error must not be greater than

10^{-9}.

If there are no correct ways to do the wiring, print the number -1.

Example

input.txt	output.txt

6 7 3
1 3 5
5 1 3
	27.560219778561036542194604983054

Commentary

Strictly mathematically speaking, the minimum total length of wires may fail to be achieved with any of the correct wiring plans due to the infinitely small thickness of wires. In this case, find the precise lower margin(infimum) of all possible total lengths.

Problem 5. Voting

Input file:	`input.txt`
Output file:	`output.txt`
Time limit:	2 seconds (3 seconds for Java)
Memory limit:	256 megabytes

The political situation in Berland has changed. With the opposing party candidate having won the election, the multi-level voting system has finally been canceled. Now the president of Berland is elected by a single total voting. But the conservative zealots are busy peddling the idea to the masses that the new voting is even more prone to tampering with the results than ever before. To refute these calumnies, the president requested to evaluate the costs of fixing voting results by bribing voters.

There is a total of N voters and K candidates. Each of the voters can either cast his voice for a single candidate or abstain from voting, for example, by not going to the election. Once all voters have voted (one way or another), the number of voices collected by each candidate is counted. The candidate who gets strictly the most voices wins. If there is no such candidate, the elections are deemed null and void.

You are asked to write a program based on the following statements. For each individual voter the candidate for whom he or she is going to vote is known. It is allowed to change the voter's preference to any other variant by spending a certain sum of money. The goal is for the necessary candidate to win the elections. Minimize the amount of money necessary to complete this task.

Input

The first line of the input file contains three integers: N — the count of voters in Berland, K — the count of candidates running for presidency, T — the index of candidate who needs the elections fixed in his favor ($1 \le N \le 100$, $1 \le K \le 10$, $1 \le T \le K$). Both all voters and all candidates are numbered in succession beginning from the number one.

This is followed by a costs matrix of N lines and $K+1$ columns. The element $C_{i,j}$ of the matrix defines the amount of money to be spent in order to assure that the i-th voter votes for the j-th candidate (with $1 \le i \le N$, $1 \le j \le K$). The last element $C_{i,K+1}$ in the line defines the amount of money to be spent in order to keep the voter from going to the elections.

It is guaranteed that all costs $C_{i,j}$ are integers and fall within the range of $0 \le C_{i,j} \le 10^9$. In addition, for each i strictly one of the numbers $C_{i,1}, C_{i,2}, \ldots, C_{i,K+1}$ equals zero: the zero means that the given voter has been planning to vote in the corresponding way.

Output

The first line of the output file must contain a single integer — the minimum required amount of money to be spent in order to change the voters' preferences.

The second line of the input file must contain N integers. The i-th of these numbers V_i means that the i-th voter must vote for the V_i-th candidate($1 \le V_i \le K+1$). The special value $V_i = K+1$ means that the i-th voter must skip the elections.

If there are several optimal solutions, print any of them.

Example

input.txt	output.txt

5 2 2
0 9 2
0 10 1
7 8 0
0 2 1
3 0 1
	3
	1 3 3 2 2

Example explanation

The example suggests that the second voter's preference must be changed to skipping the elections (costing 1 unit of money), and that the fourth voter must be persuaded to vote for the desired candidate (costing 2 units). As the result, only the first voter is going to vote for the first candidate, with the fourth and fifth voters voting for the second candidate.

Problem 6. Finite automaton

Input file:	`input.txt`
Output file:	`output.txt`
Time limit:	2 second
Memory limit:	256 megabytes

Today Vasya learned what a «deterministic finite automaton» (DFA) is, and he's aching to tell everyone about it.

As it turns out, there are N states in a DFA. The automaton can be in any one of these state at any given moment during its work. The input of the automaton is an arbitrary string, and after its work, the automaton tells whether the string is *acceptable.*

The automaton works in the following manner:

1. In the beginning of its work, the automaton is in the *start* state, which is always marked as such.
2. The automaton *reads* all symbols of the string one by one from left to right. After reading each symbol, the automaton can switch to a different state (described in detail below).
3. After the string is read completely, the automaton defines the answer based on the state in which it ended up.

For each state u of the automaton and each possible symbol c, automaton defines in which state will it be afer reading the symbol c, if it was in the state u beforehand. This new state can either be the same state u or be a different state. Moreover, for each state the automaton defines the answer it will give (whether the string is accepted or not) if it finished in that state.

In the first seminar on the subject, Vasya constructed all sorts of DFA's, and he was given the following problem for «homework». Build a DFA which, given a non-negative integer written in the B-ary numeral system, accepts those and only those integers that are divisible by the given module M.

To simplify, Vasya assumes that the input number:

- begins from high-order digits (they're written on the left, big-endian);
- can have leading zeroes;
- can be empty: in this case it is equal to zero and is definitely divisible by M.

Vasya is a born perfectionist, and he wants to learn how to build DFA's that meet the problem requirements with the **smallest** possible number of states, He asked you to help him.

Input

The only line of the input file contains two integers: B — the base of the positional numeral system in which the input number is given and M — the module which all acceptable and only acceptable numbers must be divisible by ($2 \leq B \leq 16, 2 \leq M \leq 10^5$).

Output

Print the description of the smallest DFA meeting the problem requirements to the output file.

The first line of the output file must contain two integers: N — the count of states in the automaton ($N \geq 2$) and S — the start state number ($0 \leq S < N$). All states are numbered successively beginning from zero.

The second line must contain N space-separated symbols. The k-th of these symbols defines the answer the automaton gives if it ends up in the k-th state upon the completion of its work ($0 \leq k < N$). A symbol equals ‘G’ if the string should be deemed acceptable, and ‘B’ otherwise.

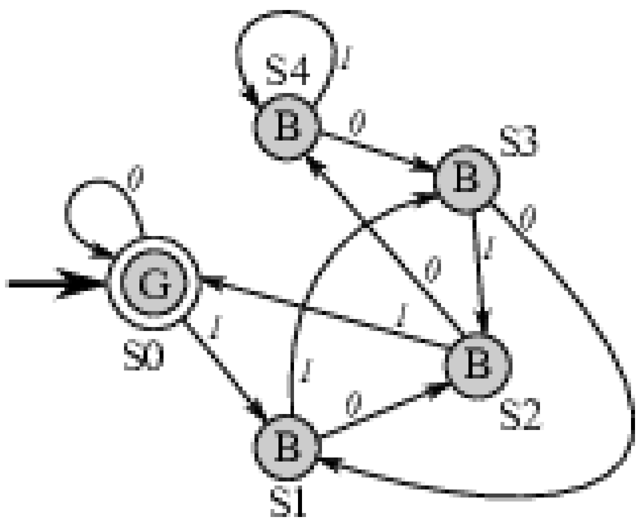
There must be N line following, each containing B integers. The k-th number in the i-th of these lines contains the state number in which the automaton ends up after reading digit k, if before that it was in the state i ($0 \leq i < N$, $0 \leq k < B$). This number can be any integer between 0 and $N - 1$ inclusively.

Example

input.txt	output.txt
2 5	5 0 G B B B B 0 1 2 3 4 0 1 2 3 4

Example explanation

Shown below is the DFA used in the sample. The letter “S” and the number are shown near each state. Bold arrow points to the start state. Each normal arrow describes the state the DFA goes to after reading the digit written near the arrow.



Problem 7. Scene management

Input file:	`input.txt`
Output file:	`output.txt`
Time limit:	3 seconds
Memory limit:	256 megabytes

The web-application frenzy has swept through the programming world. Nowadays, customers want to run everything in the browser, defying logic and common sense. Unfortunately even though Stepan works exclusively in the computer-aided design (CAD) domain, he wasn't able to stay away from the web. Now he has to write code in javascript language, where you can take a promise that a job will be done, but can't wait for its completion.

Especially sad is the peformance situation in the javascript world, including the computer graphics performance. While the whole world is thoroughly enjoys playing the new Doom having enabled multithreaded renderer on low-level "Vulkan" graphics API, Stepan has to work with three.js — a wrapper around the "WebGL" API, — an abridged heavyweight OpenGL variant from a decade ago. No wonder that rendering a model with a couple thousands of elements lags mercilessly even on Core i7 and any graphcis card.

A distinguishing feature of CAD graphics is that the state of the objects on scene changes very rarely. Stepan has implemented his own renderer that can improve performance by merging the objects and rendering them by «blocks». Renderer has to be notified about the changes happening on the scene by calling methods «add object», «remove object», «update object». Unfortunately, Stepan's colleagues are reluctant to call these methods manually: they are used to the rich three.js interface, and there's already a lot of code using three.js directly. So Stepan was forced to write an intermediary layer, which will automatically track the changes on the three.js-scene and notifies the renderer about them.

The scene in three.js is a rooted tree with each node representing an object to be rendered. Each object has an unique identifier (ID) — a positive integer distinct from identifiers of all other objects. Every object has a set of children, whose order is irrelevant. Every object also has a set of properties (such as coordinate transformations) which influence the appearance of all objects in the subtree. Three.js users can perform the following operations with objects:

- `A.add(B)`: add object B as a new child of object A.
- `A.remove(B)`: remove object B from the set of children of object A.
- `A.modify()`: change properties of object A.

Note that the `remove` operation doesn't delete objects but just disconnects the subtree from the scene tree (the programmer can't really delete objects in javascript — it's garbage collector's job). User can connect the disconnected objects to the scene later with the `add` operation. In a general case there can be multiple disjoint object trees in any moment of time: one scene tree to be rendered, and an arbitrary number of "disconnected" subtrees that don't need to be rendered.

Users guarantee that their operations on objects are correct:

1. When `A.add(B)` is performed, object B **doesn't** have a parent, and object A `isn't` a descendant of B (and isn't equal to B).

2. When `A.remove(B)` is performed, object B is in the set of children of object A.

3. Root scene object is **never** added as a child to another object.

Owing to the last guarantee it's always easy to determine which object tree is the scene, because the root of scene tree stays the same.

To «bind» the three.js scene tree to the new renderer, Stepan has implemented the intermediary layer in the following manner. Every frame, when the renderer is called, the layer traverses the whole scene. Next it compares all present object with those that were present during the previous frame render, and calls all neccessary renderer methods. Unfortunately due to javascript general sluggishness the full scene traversal takes several milliseconds for large models, and Stepan really wants to avoid the traversal on every frame. He thinks that it's easy to determine all changes that occured since the last frame by tracking all operations issued by users on three.js objects.

You need to write the new implementation of the intermediary layers which will be called every frame, takes a sequence of operations, happened since the last frame as an input, and returns three lists of objects as an output:

- `added`: objects which are on the scene in this frame, but were **not** on the scene in the previous frame.
- `removed`: objects which are **not** on the scene in this frame, but were on the scene in the previous frame.
- `modified`: objects which are on the scene in this frame, were on the scene on the previous frame and which *need to be updated.*

Object A *needs to be updated*, if one of the following is true:

1. Since the previous frame render, one of the ancestors of A or A itself was disconnected from its parent by the `remove` operation (i.e. the path to the scene root has bene broken at least once).
2. The `modify` operation was called on A or one of its parents since the previous frame render. (i.e. there was a modification on the path to the scene root).

You can note that object **doesn't** *need to be updated* when and when there weren't any changes on the path from it to the scene root: neither structural tree changes, nor internal object property changes.

Input

The initial tree state is described first in the input. There are no object not on the scene initially.

The first line contains an integer N – the number of objects in the scene tree ($1 \le N \le 100\,000$). Each of the following N lines describes objects on the scene in the arbitrary order, one per line. The object identifier is given first — the positive integer between 1 and 10^9. Next is the number of its children, and after that are the identifiers of the children, separated by spaces (in an arbitrary order, there are no duplicates).

You can assume that all described objects form a single tree, and that the root of the tree is root scene object.

The following line contains the integer M — the number of operations ($1 \le M \le 200\,000$). The following M lines describe operations, one per line.

Depending on the type, operation has the format:

- `add A B`
- `remove A B`
- `modify A`
- `render`

The `add`, `remove`, `remove` operation descriptions was given above, in the problem statement. Identifiers of objects, which the operation acts upon, is substituted for `A` and `B` in each operation. You can assume that all these objects were in the scene tree initially. The `render` operation starts the next frame render.

It's guaranteed that **the height of every object tree doesn't exceed** 1000 in any moment of time.

Output

For every `render` operation you must output all changes, that happened since the last `render` operation. If there were no previous `render` operations, you must output all changes caused by all operations before it.

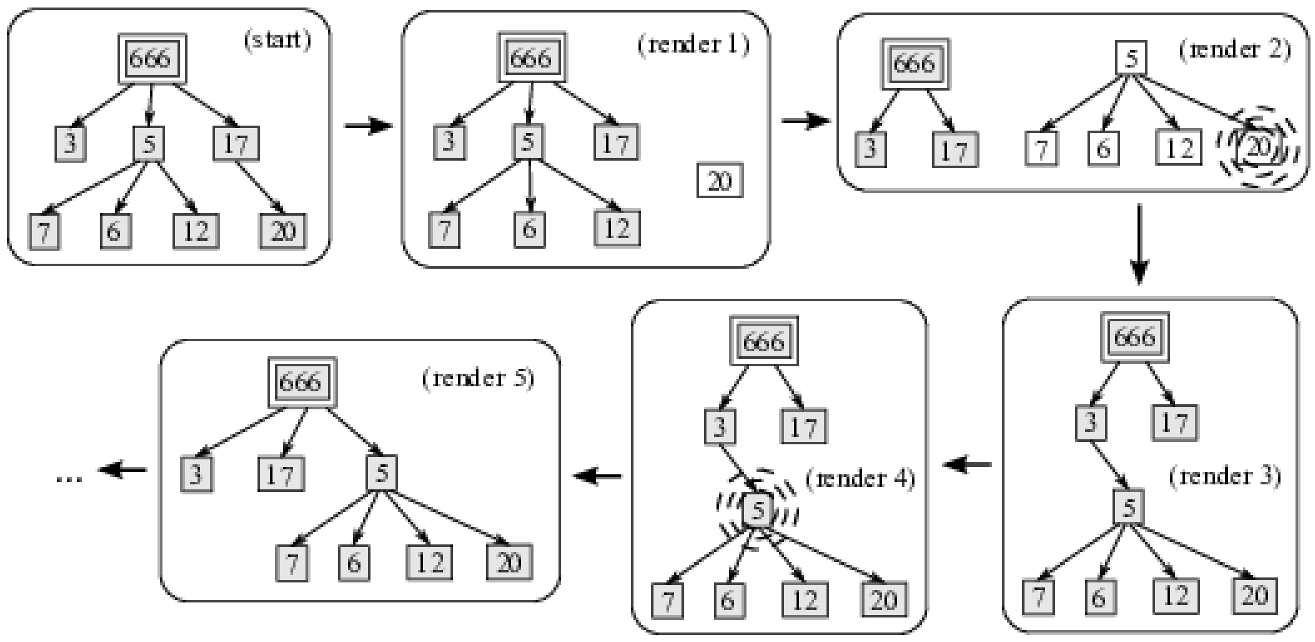
Changes must be output with three object lists: `added`, `removed`, `modified`. The description of these lists is given in the problem statement above. For every list you must output in one line, separated with spaces: the name of the list, number of objects in the list, identifiers of all objects in the list.

Changes for the `render` operations must be output in the same order as these `render` operations were issued. In each description you must output the lists in this order: `added`, `removed`, `modified`. You must output the identifiers in each list in the increasing order.

The following upper bounds on the output file size is guaranteed. The total number of objects in the answer (for all frames and for all lists) doesn't exceed 300 000. The number of `render` operations doesn't exceed 20 000.

Example explanation

You can see the state of the objects by the time each render operation is issued in the sample illustration. The sample itself is given below.



Example

input.txt	output.txt
8	added 0
3 0	removed 1 20
5 3 7 6 12	modified 0
17 1 20	added 0
7 0	removed 4 5 6 7 12
6 0	modified 0
12 0	added 5 5 6 7 12 20
20 0	removed 0
666 3 3 5 17	modified 0
14	added 0
remove 17 20	removed 0
render	modified 5 5 6 7 12 20
remove 666 5	added 0
add 5 20	removed 0
modify 20	modified 5 5 6 7 12 20
render	
add 3 5	
render	
modify 5	
render	
remove 3 5	
add 666 5	
render	
modify 666	

Problem 8. A system of balance scales

Input file:	`input.txt`
Output file:	`output.txt`
Time limit:	1 second
Memory limit:	256 megabytes

A complicated system of balance scales and weights is set out on the floor. Each set of balance scales consist of a stand, a beam and two cups. The beam is **not** fixed and rests on the stand with a single point in such a manner that it can rotate freely around it in the vertical plane. Precise bearing point selection allows a state of nonstable equilibrium in horizontal position. Cups are attached to the beam ends, and they usually hold objects whose weights are to be compared. The distance from the bearing point to the cup is called a shoulder. The rule states that upon reaching the equilibrium shoulders correlate in the same way as do the weights of the objects in the cups. The system of balance scales and weights works in the following way: Each of the cups of all scales holds either a balance weight or another pair of balance scales. There is strictly one pair of balance scales standing directly on the floor, with all other scales standing in cups of other scales. The weights of all balance weights are known, and the weight of the scales themselves are negligibly small compared to the balance weights. All scales are always in the state of equilibrium owing to correct choice of bearing points. The sizes of balance weights, cups and stands are also negligibly small compared to the length of beams.

Process a sequence of queries of two types.

1. Change the weight of a given balance weight.
2. Learn the position of the bearing point of a given pair of scales.

After each weight change of any balance weight equilibrium must be restored in all scales in the system, with some of its bearing points shifting in the process.

Input

The first line contains two integers: N — the number of scales in the system($1 \le N \le 5 \cdot 10^4$) and K — the number of queries ($1 \le K \le 10^5$).

All scales are numbered with integers beginning from one and up. Scales with the number 1 stand on the floor. All balance weights are also numbered with integers beginning from one and up.

The second line contains $(N + 1)$ integers: the t-th of these numbers W_t defines the initial weight of the balance weight with the number t ($1 \le W_t \le 10^9$).

The following N line describe the scales. The i-th of these lines contains three integers: S_i — length of the beam of the i-th pair of scales ($1 \le L_i \le 10^4$), L_i — number of the scales standing in the left cup of the i-th scales and R_i — number of the scales standing in the right cup of the i-th scales. If the left cup is occupied by scales, then $i < L_i \le N$, if it is occupied by a balance weight, then L_i equals the number of the balance weight with a «minus» sign, with $1 \le -L_i \le N + 1$. Similarly, R_i defines either the number of the standing scales ($i < R_i \le N$) or the number of the balance weight with a «minus» ($1 \le -R_i \le N + 1$).

This is followed by K lines, with every j-th line containing a single query. The query description begins with an integer t_j, defining the query type ($1 \le t_j \le 2$). If $t_j = 1$, it is followed by two integers: k_j — number of the balance weight with its weight being changed ($1 \le k_j \le N+1$), V_j — new weight of the balance weight($1 \le V_j \le 10^9$). If $t_j = 2$, it is followed by a single integer k_j — the number of scales for which the position of its bearing point must be found ($1 \le k_j \le N$). There are no other types of queries.

Output

For each query to define the bearing point a single integer must be printed: the distance from the left cup of the scales to the bearing point. Answers must be produced in the order of occurence of the corresponding queries in the input data. The absolute or relative error of each answer should be less than or equal 10^{-13}.

Example

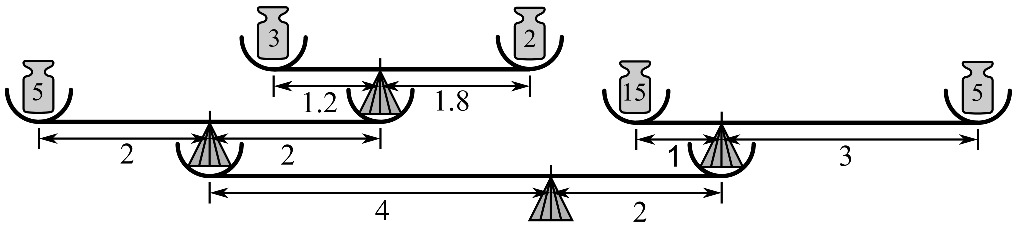
input.txt	output.txt

```
1 1
15 20
10 -1 -2
2 1
```
	`5.7142857142857142857142857142857`

```
4 9
3 2 5 5 15
6 2 3
4 -3 4
4 -5 -4
3 -1 -2
2 1
2 2
2 3
2 4
1 4 45
2 3
1 5 45
2 3
2 1
```
	```
	4
	2
	1
	1.2
	3
	2
	5.4
	```

Example explanation

Initial state of the system from the second sample:



Problem 9. Karmon be ill

Input file:	`input.txt`
Output file:	`output.txt`
Time limit:	1 second
Memory limit:	256 megabytes

Vasya loves catching karmons. Every karmon has a numerical parameterBP (battle power). The larger the parameter value, the stronger the karmon — and the more valuable.

Vasya's feeling ill and he's asked his friend Peter to go karmon trapping instead of him. Peter has agreed, but Vasya also asked for another thing: he wants Peter to report the BP sum of the K most powerful currently caught karmons every time Peter catches another karmon. Peter has found this request a bit weird, but there's nothing he wouldn't do for an ill friend. Nevertheless he decided to clarify things and asked Vasya what should be done if he hasn't yet collected K karmons. Vasya gave it a thought and decided that in this case, Peter shouldn't report anything at all.

Help Peter write a program that is fed a list of BP's of the caught karmons and produces the values to be reported to Vasya.

Input

The first line contains two integers: N — the total number of the trapped karmons and K — the number of karmons for which the sum of their BP must be reported ($10 \leq N \leq 100\,000$, $2 \leq K \leq \min(N, 1000)$).

The second line contains N integers defining the karmons' BP in order of catching. All these numbers lie within the range of 1 to 10 000 inclusively.

Output

The single line of the output file must contain $(N - K + 1)$ integers — the sums of BP for the K most powerful karmons after catching each karmon (beginning from the K-th one).

Example

input.txt	output.txt
14 4 1 2 3 4 5 6 7 8 9 10 1 1 1 1	10 14 18 22 26 30 34 34 34 34 34

Problem 10. Battle City Online

Input file:	`input.txt`
Output file:	`output.txt`
Time limit:	8 seconds
Memory limit:	256 megabytes

Peter and Vasya have been avid fans of a NES-game called «*Battle City*», better known among gamers as «*Tanks*». A recent joyous occasion was the official release of a modern online version of the game «*Battle City Online 2016*» («*BCO 2016*»). They got the new game right away and got deep into studying the gameplay. It would be an understatement to say they were surprised to discover they were the only players in the game when they went online and connected to the game server. The screen was adorned with a nearly empty game map, which is a checkered rectangular 8×8 field, bearing a single tank driven by the controllers in the guys' hands. Each of the two identical controllers had eight buttons: four directional buttons and four buttons for shooting in each direction.

Each cell in the field is either empty or occupied by a stretch of brick or armored wall, or an area of a water body. Initially the tank is situated in an empty cell. When game processes a push of a movement button, the tank is moved in the required direction to the adjacent cell if that cell is empty. If the adjacent cell in the given direction is nonexistent or non-empty, the tank doesn't change its position upon the processing of the button signal. Upon pushing a shooting button a fragment of wall nearest to the tank in the given direction is considered. If such a fragment exists and is made of brick, it is destroyed (the cell becomes empty until the end of the game).

It looked like Peter and Vasya were about to give up all hopes of having fun playing the game, but suddenly Peter noticed that the game developers failed to implement simultaneous control of the tank using both controllers. If at any single moment of time both players push a button on their controllers, only one of the two pushes will be processed. The acting controller is then chosen equiprobably.

Peter and Vasya came up with the following game. They close their eyes, holding the controllers. Each of them performs N pushes on his controller — one push per second. This way, there are two simultaneous pushes every second, of which only one is processed.

You may have already guessed that the guys would bet on which cell the tank will end up at, once all pushes at all moments of time are processed. The one, whose guess is closer to the result, wins.

The thing is, Vasya is planning to cheat. He knows perfectly well which buttons Peter is going to push on his controller, and has already decided which buttons he's going to push himself. For each cell of the game field, he needs to know the probability of the tank ending up in that particular cell in the end. He's asking you to calculate these probabilities. Your task is to write a program which would calculate these values with maximum precision.

Input

The first line of the input file contains a single integer N — the number of button pushes by each of the players ($1 \le N \le 30$). The second line contains N symbols describing Peter's pushes. Similarly, the third line contains N symbols describing Vasya's pushes.

Each of the symbols in the second and third line can be one of the following:

- «`u`» — move up (to the previous line),

- «`d`» — move down (to the next line),
- «`l`» — move left(to the previous column),
- «`r`» — move right(to the next column),
- «`U`» — shoot up,
- «`D`» — shoot down,
- «`L`» — shoot left,
- «`R`» — shoot right.

The following eight lines, define the game map. Each line is eight symbols long. Each of the symbols of the game map is one of the following:

- «`.`» — empty cell,
- «`B`» — brick wall,
- «`A`» — armored wall,
- «`W`» — water body,
- «`T`» — tank starting location.

Output

The output file must contain eight lines, each containing eight probability values as a non-reducible fractions P_{ij}/Q_{ij}. The j-th fraction at the i-th line should be the probability of the tank ending up in the cell located at the intersection of the i-th line and j-th column.

The denominator must always be printed, even if it equals to one. See the examples below clarifying the task.

Example

input.txt

```
5
rrrru
DUDUd
W....WWW
......WW
.BBWW...
.T......
.AABB...
........
B......A
BB....AA
```

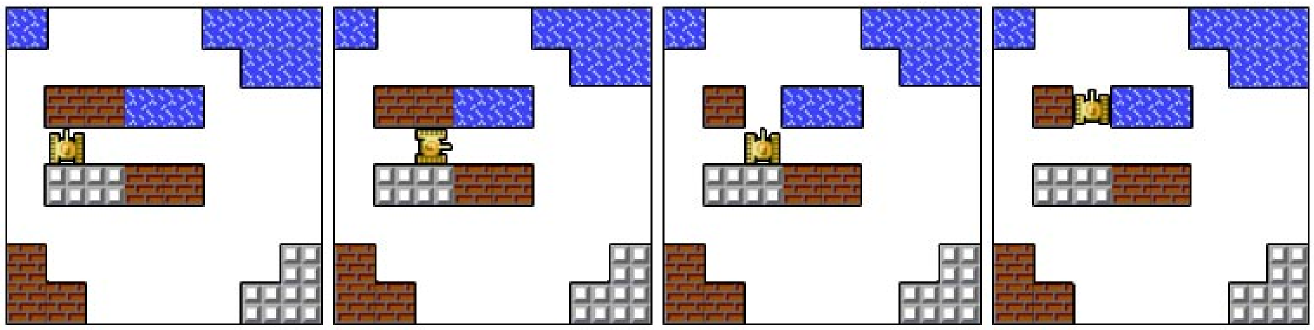
output.txt

```
0/1  0/1  0/1  0/1  0/1  0/1  0/1  0/1
0/1  0/1  0/1  0/1  0/1  0/1  0/1  0/1
0/1 1/32 3/32  0/1  0/1 1/32  0/1  0/1
0/1 1/32 5/32 11/32 1/4  0/1  0/1  0/1
0/1  0/1  0/1  1/32 0/1 1/32  0/1  0/1
0/1  0/1  0/1  0/1  0/1  0/1  0/1  0/1
0/1  0/1  0/1  0/1  0/1  0/1  0/1  0/1
0/1  0/1  0/1  0/1  0/1  0/1  0/1  0/1
```

Example explanation

Spaces were added in this example of the output file to ease the visual perception.

The following graphic shows one of possible routes «DrDUu». First and third moves are shootings towards the armoured wall. Please note, how a brick wall is destroyed on the forth move.



Problem 11. Test generation

Input file:	`input.txt`
Output file:	`output.txt`
Time limit:	2 seconds
Memory limit:	256 megabytes

A while ago Pasha came up with a simple problem for a programming contest training session. The input data in the problem consists of the line S containing N digits, and three integers L, R and P ($1 \le L \le R \le N$, P being a prime number). The requested output was the remainder from the division of the subnumber formed by digits at the positions from L through R, inclusively, by the number P. It should be noted that this subnumber may contain leading zeroes. Pasha prepared the problem description, wrote a solution and prepared lots of tests to check the solutions.

Before a practice session, Pasha discovered that T files with input test data were gone, and only the corresponding answer files remained. He remembers that the line S in all these tests was identical, moreover, he remembers that line perfectly well. Similarly, he remembers the value of P, which was also identical in all missing tests. To recover the lost input data, Pasha is asking for your help. Write a program which is given a line S of the length N, the numbers P and T, as well as T values of A_i — the answers for the lost test data. For each A_i, the program must figure out the number of different pairs $\{L_i, R_i\}$ ($1 \le L_i \le R_i \le N$) — the pairs of acceptable values from the input file, as well as find one of these pairs.

Input

The first line of the input file contains the line S, consisting of N decimal digits ($1 \le N \le 10^5$). The second line of the input data contains two integers T and P — the number of the lost tests and the prime number, for which the remainder from the division by that number was to be calculated.($1 \le T \le 100$, $11 \le P \le 10^9 + 33$, P — the prime number). This is followed by T lines, with the i-th line containing a single integer A_i — the answer for the i-th test input dataset ($0 \le A_i < P$).

Output

For each of these T solutions, the output file must receive three integers C_i, L_i and R_i — the number of different acceptable pairs of input values, and the values of one of those pairs, respectively. If Pasha has made an error when preparing the tests, and there are no acceptable pairs for a solution, three zeroes must be printed.

Example

input.txt	output.txt

923813
4 17
5
3
15
13
	2 1 3
	3 3 3
	0 0 0
	3 4 5