TUYMAADA-2018. INFORMATICS
Day Two

E. Penalty

Time limit: 2 seconds
Memory limit: 256 megabytes

The Russian national football team is making history — it has reached World Cup quarter-finals, where it will play Croatia. Stanislav Cherchesov, the Russian coach, understands that the only way to win is to take Croatia to penalty shootout. So the whole team is practicing shooting penalties.

In order to choose the best performers for penalty shootout, the coaches have analyzed the statistics for Russian players and the Croatian goalkeeper Danijel Subasic. Based on these statistics, they have made up *a penalty kick map* for all of them. To obtain the map, the area of the goal was divided into $N \times M$ equal rectangles, and for those rectangles they have calculated the probability to score penalty for Russian players and to save the penalty for the keeper.

The coaches now want to combine this data and select the players who have the greatest total area of those rectangles for which the *penalty probability* is not less then 0.65. If there are several players with equal areas, then the one whose name comes lexicographically first is selected.

The "penalty probability" mentioned above for a given rectangle is the product of the probability to score a penalty in it for the player and the probability to concede a penalty in this rectangle for the keeper.

You are asked to help to Russian team and develop a program that will list the names of 5 best penalty shooters.

Input

The first line contains two integer numbers N, M ($0 < N, M \leqslant 100$). The next line contains an integer number K ($6 \leqslant K \leqslant 100$), the number of team members. The following lines contain "the penalty kick map" for Danijel Subasic. Then come the name (first and last names) and the "penalty kick map" for each player of the Russian team. Each "penalty kick map" is a matrix of size $N \times M$, whose elements a_{ij} ($0 \leqslant a_{ij} \leqslant 1$) are real numbers giving with two decimal places the possibility to score penalty for a player or a probability to save a penalty for the goalkeeper.

Output

Program should output names of five team members, that will take a penalty kick. Each name must be printed on a separate line.

Scoring

This problem contains two subproblems. Points will be awarded for a subproblem only if all the tests in it passed. Subproblems are evaluated independently.

Subtask 1 (points: 30)

$N \leqslant 2, M \leqslant 2, K \leqslant 10.$

Subtask 2 (points: 70)

No additional limitations on N and M.

Example

standard input	standard output
3 3 6 0.05 0.90 0.05 0.95 1.00 0.95 0.75 1.00 0.75 Alan Dzagoev 0.85 0.90 0.85 0.95 1.00 0.95 0.85 1.00 0.85 Sergey Ignashevich 0.87 0.87 0.87 0.85 1.00 0.85 0.85 1.00 0.85 Artem Dzyuba 0.90 0.90 0.90 0.90 1.00 0.90 0.75 1.00 0.75 Alexandr Golovin 0.80 0.80 0.80 0.85 1.00 0.85 0.75 1.00 0.75 Denis Cheryshev 0.85 0.80 0.85 0.85 1.00 0.85 0.85 1.00 0.85 Mario Fernandes 0.75 0.90 0.75 0.75 1.00 0.75 0.55 1.00 0.55	Alan Dzagoev Alexandr Golovin Artem Dzyuba Denis Cheryshev Mario Fernandes

Remark

In the probability theory, the sum of probabilities of mutually exclusive events equals one:

$$P(A) + P(\overline{A}) = 1,$$

where A is some event (for example, player scored penalty), $\overline{A}$ — negation of this event (goalkeeper saved penalty).

F. Yet another unusual equation

Time limit: 2 seconds
Memory limit: 256 megabytes

Consider the equation

$$X^2 + mX + b - P = 0, \tag{1}$$

where m is the number of decimal digits in the positive root of the equation (1), and b is the negative root of the equation (1).

For a given integer P, find the positive integer root of the equation (1).

Input

A single integer number P ($0 < P < 10^{21000}$).

Output

Output the positive integer root of the equation (1). If the equation has no such root, output `-1`.

Scoring

This problem contains four subtasks. Points for the first three subtasks are awarded only if solution passes all the tests from this subtask. Points for each test of the last subtask are awarded independently. The subtasks are evaluated independently.

Subtask 1 (points: 10)
$P < 10^5$.

Subtask 2 (points: 20)
$P < 10^{10}$.

Subtask 3 (points: 30)
$P < 10^{90}$.

Subtask 4 (points: 40)
No additional limitations.

Example

standard input	standard output
208	14

G. Clustering evaluation

Time limit: 1 second
Memory limit: 256 megabytes

Clusterization is one of the most important aspects of now popular machine learning. Clusterization is the task of grouping the set of n objects into m sets (called *clusters*), so that objects in the same groups are similar to one another (for example, they are close in sense of some metric, or any other similarity measures).

Marina came up with a new clustering algorithm. To figure out whether her algorithm is working well, Marina run it on some data, for which she knows the reference clustering. Help Marina to calculate the number of pairs of objects that are classified correctly by her algorithm. We consider the pair of objects to be classified correct in one of two cases: either both of these objects are in the same cluster in both clusterings, or these two objects are in different clusters in both clusterings.

Input

First line contains two integers n and m ($1 \leqslant m \leqslant n \leqslant 10^5$) — the number of objects and the number of clusters. Second line contains the description of reference clustering: n integers a_i ($1 \leqslant a_i \leqslant m$) — number of set of i-th object in reference clustering. Third line contains the description of clustering produced by Marina's algorithm: n integers b_i ($1 \leqslant b_i \leqslant m$) — number of set of i-th object in Marina's clustering.

Output

Output one integer — the number of pairs of correctly classified objects.

Scoring

This problem contains three subtasks. Points for a subtask are awarded only if solution passes all the tests from this subtask and preceding subtasks.

Subtask 1 (points: 30)

$n \leqslant 1000$.

Subtask 2 (points: 40)

$n \leqslant 10^5, m \leqslant 10$.

Subtask 3 (points: 30)

No additional limitations.

Examples

standard input	standard output
5 3 1 2 3 1 3 2 1 1 2 1	8
4 3 1 2 3 2 3 1 2 1	6
4 4 1 2 3 4 1 1 1 1	0

Remark

In the first sample there are two incorrectly classified pairs: $(2, 3)$ and $(2, 5)$. All other $\frac{5 \cdot 4}{2} - 2 = 8$ pairs are classified correctly.

H. Parallel computing

Time limit: 1 second
Memory limit: 256 megabytes

In addition to participating in «Tuymaada», your team also decided to take part in a hackathon. To train a neural network, your team will need a lot of computational power, so you decided to contact the nearest data center.

The data center has n servers, ready to be rented. Servers are arranged in a row and are enumerated from 1 to n from left to right. It costs c_i rubles to rent the i-th server, and its computational power is equal to p_i. You have C rubles and you must rent servers having at least P units of computational power. Due to the data center rules, you have the provide the cables yourself, so you would like to make the distance between the first rented server and the last rented server as small as possible.

You still haven't decided which servers you are going to rent, so for each possible first server you would like to find the minimum possible last server to minimize the length of cables you have to bring. Formally, for each L from 1 to n you need to find the minimum R such that you can select some servers from segments $[L, R]$ so that their total cost is no more than C rubles and they have at least P units of computational power in total.

Input

The first line contains integers n, C and P ($1 \leqslant n, C, P$; $n \leqslant 10^5$, $nC \leqslant 10^6$, $P \leqslant 10^{18}$) — the number of servers, your maximum budget in rubles and required total computational power. Next line contains n integers c_i ($1 \leqslant c_i \leqslant C$) — costs of server rent. Next line contains n integers p_i ($1 \leqslant p_i \leqslant P$) — computational powers of servers.

Output

Output n integers, the minimum possible values of R for $L = 1, 2, \ldots n$. If there is no suitable R, output -1.

Scoring

This problem contains three subtasks. Points for a subtask are awarded only if solution passes all the tests from this subtask and preceding subtasks.

Subtask 1 (points: 30)
$n, C, P \leqslant 20$.

Subtask 2 (points: 10)
$n, C \leqslant 500$.

Subtask 3 (points: 60)
No additional limitations.

Example

standard input	standard output
7 12 20 10 3 6 1 5 10 5 20 10 8 2 10 3 8	1 4 5 7 -1 -1 -1