Problem A. Minimum cost maximum flow

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

You are given a directed graph, where each edge has a capacity and a cost. Find the minimum cost maximum flow from the vertex 1 to the vertex n.

Input

The first line of the input file contains n and m ($2 \le n \le 100$, $1 \le m \le 1000$) — the number of vertices and the number of edges. Each of the next m lines contains four non-negative integers describing an edge: the source vertex, the target vertex, the capacity and the cost. The vertices are numbered starting from 1. Capacities and costs do not exceed 10^5.

Output

Output the single number — the cost of the minimum cost maximum flow from the vertex 1 to the vertex n. It is guaranteed that the answer does not exceed $2^{63} - 1$, and the graph does not contain cycles with negative costs.

Examples

system input	system output
4 5 1 2 1 2 1 3 2 2 3 2 1 1 2 4 2 1 3 4 2 3	12

Problem B. Domino in Casino

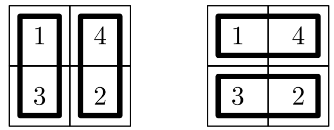
Input file:	`system input`
Output file:	`system output`
Time limit:	2 seconds
Memory limit:	256 megabytes

Domino is well known as a game played by people at streets when they relax after a workday. So it was, until recently John Bigbuck introduced domino in his casino "*BUMP*" (Bring Us Money, Please).

Of course, ordinary domino games are not well suited for casino, so John had to introduce his own game. The game is played on a rectangular board of size $m \times n$. Each cell of the board contains some integer number.

The player has k domino tiles — rectangles 2×1. The player puts the tiles to the board without overlapping and his winning is calculated as the sum of products of numbers under each tile.

For example, there are 2 ways to put 2 tiles on a 2×2 board. For the board below, the better way to put the tiles is shown on the left — in this case the sum is $1 \times 3 + 4 \times 2 = 11$. If the player puts tiles to the board as shown on the right picture, the sum would be $1 \times 4 + 3 \times 2 = 10$, which is smaller.



Given the board, and the number of the tiles the player has, find what is the maximal sum he can get.

Input

The first line of the input file contains integer numbers m, n and k ($1 \le m \le 16$, $1 \le n \le 100$, $1 \le k \le 200$). The following m lines contain n integer numbers each and describe board. Numbers written on the board are non-negative and do not exceed 1000. It is guaranteed that it is possible to arrange all tiles on a board.

Output

Output one integer number — the maximal sum a player can get.

Examples

system input	system output
2 2 2 1 4 3 2	11

Problem C. Teams

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

The main contest of "SWEERC" is coming soon. Teams came from n different universities. Each university is represented by exactly two teams. The teams already have sat down and the organizers discovered that some teams from the same university sit very close to each other. The organizers have serious problems with rearranging participants of the olympiad.

Tables at which teams sit are placed in a row. The distance between two adjacent tables equals 10 meters. The organizers want to make the minimal distance between workplaces of two teams from the same school as bigger as possible.

To move a team organizers have to spend a lot of time. Therefore the organizers want to move teams in a way that the sum of distances between old and new workplaces of teams is as small as possible.

For example, two teams from universities $1, 2, 3$ and 4 are involved in the competition. Suppose that the initial placement of teams is $1, 3, 2, 2, 1, 4, 4, 3$ (for each workplace the id of the university of the team is specified). In this case, the teams from university 2 sit too close, as well as the teams from university 4. If the organizers rearrange teams in the order $1, 3, 2, 4, 1, 3, 2, 4$, the distance between two teams from the same school is not less than 40 meters. The greater distance could not be achieved. The sum of the distances between the old and new positions is $0 + 0 + 0 + 20 + 0 + 20 + 30 + 10 = 80$ meters, it is minimal for this example.

Given the initial placement of the teams your task is to rearrange the teams in order to maximize the minimal distance between teams from the same school. Moreover, new arrangement of the teams should be chosen from all possible arrangements, such that the sum of distances between old and new positions is minimal as possible.

Input

The first line of the input file contains a single number n — the number of teams ($1 \le n \le 100$). The second line contains the sequence $a_1, a_2, \dots, a_{2n}$ — the initial locations of the teams. For each team the identifier of university is specified. It is guaranteed that the sequence contains only numbers from 1 to n and each number occurs exactly twice.

Output

The sole line of the output should contain the final placement of the teams that satisfies the constraints. If there are several optimal solutions, output any of them.

Example

system input	system output
4 1 3 2 2 1 4 4 3	1 3 2 4 1 3 2 4

Problem D. Agrarian Reform

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

The King of Squaredom is planning the agrarian reform. The Squaredom has the form of rectangle of $m \times n$ squares. Squares are identified by pairs (x, y) where x ranges from 1 to m, and y ranges from 1 to n. Each square is either occupied by a peasant's house, or contains a swamp, or is a field. The King would like to assign peasants to fields, so that each peasant was assigned to exactly one field, and each field was assigned as most one peasant.

The King asked his Minister of Agronomy to prepare the list of peasants. After that he would assign them to fields. The Private Counselor of the King has found out the algorithm the King will use to assign peasants to fields.

The King would look through the peasants in order they are listed by the Minister of Agronomy. For each peasant he would find the closest to his house field that has no peasant assigned to it yet. That field would be assigned to this peasant. If there are several such fields, the field which has the smallest x will be chosen, if there are still several such fields, the field which has the smallest y among them will be chosen. The distance between squares (x_1, y_1) and (x_2, y_2) is $|x_1 - x_2| + |y_1 - y_2|$.

The Minister of Agronomy would like to order peasants in such a way that the sum of distances between peasant and the field he is assigned to for all peasants were as small as possible. Help him to find such order.

Input

The first line of the input file contains four integer numbers: m, n, k and s — the size of the field, the number of peasants, and the number of swamps, respectively ($1 \le m, n \le 20$, $1 \le k \le mn/2$, $0 \le s \le mn - 2k$). The following k lines contain coordinates of squares where peasants live, the i-th of these lines contains two integer numbers x_i, y_i ($1 \le x_i \le m$, $1 \le y_i \le n$). No two peasants live in the same square.

The following s lines contain coordinates of squares containing swamps.

Output

Output k numbers — the order in which the Minister of Agronomy should order peasants so that the King assigned them to the fields in the optimal way.

Example

system input	system output
3 5 5 0 2 3 2 4 1 3 2 2 3 3	3 4 2 1 5

Problem E. Santa Claus

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

Santa Claus decided to buy tickets to the cinema for his elves. He knows that the elves come to the cinema in pairs: an elf-boy and an elf-girl. Each elf knows with whom we could go to the movie and on which movie to go.

Santa wants to by the tickets on the smallest amount in such a way that each elf will go to the movie at least once. Find which tickets to buy.

Input

The first line of the input contains n and m ($1 \leq n, m \leq 100$) — the number of elf-boys and elf-girls. The second line contains r ($1 \leq r \leq 1000$) — the possible pairs of elves. Each of the next r lines contains three integers each: an identifier of an elf-boy a_i, an identifier of an elf-girl b_i and the ticket to the movie costs c_i ($1 \leq c_i \leq 1000$).

Output

The first line of the output should contain the minimal amount to pay. Next line should contain k — the number of tickets to buy. The third line should contain k integers — the identifiers of the pairs.

Examples

system input	system output
3 3 7 1 1 3 1 2 2 1 3 4 2 1 3 2 2 9 3 1 2 3 3 11	11 4 2 3 4 6

Problem F. Gas Problem

Input file:	`gas.in`
Output file:	`gas.out`
Time limit:	2 seconds
Memory limit:	256 megabytes

Flatland's neighbour Edgeland has decided to stop importing gas from Flatland because its price went way too high. After the decision Flatland's gas company stopped pumping gas into the pipe system of Edgeland.

The pipe system of Edgeland consists of a number of gas stations connected by pipes. For each pipe it is known in which direction the gas should be pumped along the pipe.

Unfortunately, there is some problem. It is not good to completely stop gas circulation in pipes. If no gas is pumped through the pipe, its monitoring and controlling systems may get corrupted. For each pipe its minimal gas transit is known. The minimal gas transit of the pipe is the minimal amount of gas that needs to be pumped along this pipe each day to keep it intact.

After some discussion, Edgeland gas company managers decided to use some technical gas to keep the gas system working. The technical gas will be circulating inside the pipes. For each gas station the amount of gas coming to it each day must be equal to the amount of gas pupmped away from it along the pipes. The total amount of gas needed for the project is the sum of amounts of gas needed for each pipe each day.

Given the map of the gas system, help the gas company to find out what minimal amount of gas is needed to keep the gas system intact.

Input

The first line of the input file contains n and m — the number of gas stations and gas pipes in the gas system of Edgeland ($2 \leq n \leq 300$, $2 \leq m \leq 1000$). The following m lines describe gas pipes, each pipe is specified with three integer numbers — the number of the gas station where the gas must be pumped into the pipe, the number of the gas station where the gas is going along this pipe, and the minimal gas transit of the pipe. The minimal gas transit of the pipe is integer and does not exceed 10^3.

There is at least one pipe leaving from each gas station, and at least one pipe entering each gas station. No two stations are connected by more than one pipe, if there is a pipe between two stations, there is no pipe in the reverse direction.

Output

At the first line of the output file print the minimal amount of gas needed to keep the gas system intact. Each of the following m lines must contain the amount of gas that will be transported along the corresponding pipe each day.

If there is no way to keep the gas system intact, print "-1" at the first line of the output file.

Examples

gas.in	gas.out
4 5 1 2 1 2 3 1 1 3 1 4 1 3 3 4 3	10 1 1 2 3 3