Problem A. Grid

There is a grid with n rows and n columns where each cell has a non-negative integer written on it.

A cell is called a dominant cell if its integer is larger than at least m integers in the same row and at least m integers in the same column.

You are required to fill the grid with integers $1, 2, \ldots, n * n$, and maximize the number of dominant cells.

Input

The only line contains two integers n and m ($1 \le m \le n \le 2000$).

Output

Print a single line containing an integer —— the number of dominant cells.

Then print n lines each containing n integers, which describes the state of the grid.

If there are multiple possible answers, you may print any of them (You still have to maximize the number of dominant cells).

Example

standard input	standard output
2 1	2 1 4 3 2

Note

Here is one more example though the number of dominant cells is not maximized.

Input:

5 3

Output:

4

1 2 3 4 5

6 7 8 9 10

11 12 13 14 15

16 17 18 19 20

21 22 23 24 25

In this example, only 19,20,24,25 are in dominant cells.

Problem B. Stirling

After buying n different toys, yww intends to divide them into m groups. Each group should have at least one toy.

For example, yww has 4 toys $1, 2, 3, 4$. He can seperate them into 2 groups as follows:

$$\{1,2,3\} \cup \{4\}\,, \{1,2,4\} \cup \{3\}\,, \{1,3,4\} \cup \{2\}\,, \{2,3,4\} \cup \{1\}$$
$$\{1,2\} \cup \{3,4\}\,, \{1,3\} \cup \{2,4\}\,, \{1,4\} \cup \{2,3\}\,,$$

yww wonders the number of ways to grouping his toys. Since the answer is so large, he just wants to know the answer modulo 2.

Input

The first line contains two integer n, m.

Output

The first line contains a integer, representing the answer modulo 2.

Examples

standard input	standard output
461621449 119652547	1
214881769 51761437	0
4 2	1
3 3	1
5 3	1

Note

$1 \le m \le n \le 10^9$

Problem C. Cut trees

As a man with amazing power, you like cutting trees very much. Now you are in a magic forest, and there is a row of n trees in front of you, numbered from 1 to n. Each tree has a height h_i, and specially, if a tree's height equals 0, it will become a stump instead.

As an experienced tree cutter, you can cut many consecutive trees at once and decrease their heights by 1, but there **cannot** be any stumps. In other words, you can cut some consecutive trees with height > 0, and decrease their heights by 1 at a time. Each cut will cost you some strength, which equals the square of the number of trees you cut.

You like cutting trees very much, so you will keep cutting trees until all of these n trees become stumps. Because you are very busy, you want to cut as few times as possible. In this case, what is the minimum strength and the maximum strength you need to spend?

Input

The first line contains one integer n ($1 \leq n \leq 5 \cdot 10^5$), which represents the number of trees.

The second line contains n integers, and the $i-th$ integer h_i ($0 \leq h_i \leq 10^9$) represents the height of the $i-th$ tree, note that if h_i equals 0, the $i-th$ tree will become a stump instead.

Output

One line contains two integers, the minimum and the maximum strength you need to spend.

Examples

standard input	standard output
2 2 1	5 5
5 1 5 2 4 3	39 49

Note

In the first test case, the mininum number of cut is 2, so you cannot cut trees like [1], [1], [2], and spend only 3 strength, because you want to cut as few times as possible.

Problem D. Maze No.9

Two young girls explore a shattered world filled with sound: a past to be uncovered...

Now Hikari is in Maze No.9, which is a graph with n vertices and m colorful roads, i-th road connects u_i and v_i with a color c_i and a value w_i. As she walked into Maze No.9, she appreciated it for its beauty. She gathered the glass from this world piece by piece, day by day, without thinking what it is.

In fact, it is “memories". She gradually realized she is in a world full of memories. But whose memories, or of what, she can't tell for certain, but her questioning has already ended.

They say that this is true: anything in excess is a poison. The girl gradually tired of what she sees every day, she decided to make some changes. She just chose some roads and removed them. To satisfy her pleasure, two restrictions must be satisfied:

1. For all the roads which are chosen, they should form a matching.

2. For all the roads with the same color which are not chosen, they should form a matching.

As there are many solutions, she wants to minimize the maximum value of the road she chooses. Hikari certainly knows the answer, but she gives this problem to you!

A matching in a graph is a set of edges without common vertices.

Input

The first line contains two integers n and m.$(2 \leq n \leq 100000, 1 \leq m \leq 100000)$.

For the following m lines, each line contains four integersu_i, v_i, c_i, w_i.$(1 \leq u_i, v_i \leq n, u_i \neq v_i, 1 \leq c_i, w_i \leq 10^9)$

Output

The first line contains a string “Yes” if the condition can be satisfied or “No” if not.

If your answer is “Yes”, the second line contains two integers W and k, represents the maximum value and the number of roads that Hikari chooses.

The third line contains k distinct integers, represents the index of the road. You must ensure that all the value of the roads you choose is smaller than W. If there are multiple solutions, you can print any of them.

If no road is chosen, you can consider it as $W = 0$ and $k = 0$.

Examples

standard input	standard output
6 6 1 2 4 5 2 1 4 3 3 4 2 2 4 5 1 6 6 5 1 1 5 4 2 5	Yes 3 3 2 3 5
4 3 1 2 1 3 1 3 1 4 1 4 1 5	No

Note

In Sample 1, the roads indexed with 1 and 2 connect the same nodes, Hikari must choose 2 to minimize the maximum value. At the same time, road 3 and 6, road 4 and 5 don't satisfy the condition, so Hikari chooses 3 and 5 to make all the roads she chooses to satisfy the condition.

Problem E. Escape

Little Q is trapped in a maze by Little P! He must find the exit as soon as possible. Otherwise, all his toys will be stolen!

The maze is a $n \times n$ chessboard and can be described as a matrix of characters. Each character stands for a room. '.' means it is a safe room and Little Q can enter it. '#' means it is a dangerous room and Little Q cannot enter it. For each step, Little Q can move to the adjacent rooms in 4 directions, and it cost him one minute. Formally, if Little Q is in room (i, j), he can move to rooms $(i+1, j)$, $(i, j+1)$, $(i-1, j)$, $(i, j-1)$. Little Q cannot move to a dangerous room and cannot move outside the maze. 'Q' means the original room of Little Q and 'T' means the room has the exit of the maze, both of them are safe rooms.

However, there is a lock on the exit and Little Q needs to collect k(at most 9) kinds of keys to unlock it, the collecting and unlocking don't cost time. There is at most one key in each room. A room with a key can be described as a digit from '1' to '9'. For example, '1' means it is a safe room with a first kind key, and '2' means it is a safe room with a second kind key. Little Q must get those keys **in order**. It means Little Q must first get a first kind key, then get a second kind key, ..., finally, get a kth kind key. In other words, Little Q must get a key of a kind $i-1$ before he gets a key of a kind i. There is at least one key of each kind in the maze. Note that Little Q can enter or leave the exit room freely. But only after he collects all kinds of keys and open the lock, he can leave the maze.

In addition, there will be a monster in some room, described by 'M'. When Little Q enters a room with a monster for the first time, he must cost another one minute to kill the monster. After that, the room will become a safe room. There are **at most 5** monsters in the maze.

Given the description of the maze, Little Q wants you to help him calculate the minimal time(in minutes) he can leave the maze.

Input

The first line contains two integers n and $k(2 \le n \le 300, 0 \le k \le 9)$, the size of the maze and the number of kinds of keys.

The next n lines, each line contains a string with length n, describing the maze.

Output

Output one line with one integer, the minimal time(in minutes) Little Q can leave the maze. If Little Q cannot leave the maze, output "-1"(without quote).

Examples

standard input	standard output

`3 2`
`Q2M`
`##1`
`T..`
	`11`

`3 0`
`Q..`
`###`
`T..`
	`-1`

Problem F. Stardew Valley

Stardew Valley is a single game with liver. Here, you can make friends with NPCs and increase their favorable impression by giving gifts. No matter the player's gender, marriage with the same sex or opposite sex is supported.

During this game, you don't want to marry any NPCs, but you want to keep a good relationship with them. These NPCs are very picky, and only when they are given their favorite gift will they increase their favor. Now there are n NPCs, each of which has its own favorite gift type a_i. One NPC can only accept k gifts. When an NPC is given i gift that he likes, his favorable impression will increase by v_i. You have $n * k$ gifts, each of them has a type g_i. Find out the maximum total favorable impression you can get from all NPCs.

Input

The first line of input contains two integers n and $k(1 \le n \le 500, 1 \le k \le 10)$ — the number of NPCs and the number of gifts each NPC will get.

The second line contains $k * n$ integers $g_1, g_2, \cdots, g_{n*k}(1 \le g_i \le 10^5)$— the type of every gift.

The third line contains n integers $a_1, a_2, \cdots, a_n(1 \le a_i \le 10^5)$ — the favorite gift's type of the NPCs.

The fourth line contains k integers $v_1, v_2, \cdots, v_k(1 \le v_i \le 10^5)$, which is the favorable impression can get from the NPC who gets i frvorite gifts. It is guaranteed that the condition $v_i \le v_{i+1}$.

Output

Print one integer — the maximum total favorable impression.

Examples

standard input	standard output
3 4 1 1 1 1 3 1 1 1 1 3 3 3 3 1 1 1 3 7 8	24
4 3 1 3 2 3 1 2 2 1 1 1 2 2 1 3 1 2 1 2 10	24