Codeforces Round #214 (Div. 2)

A. Dima and Guards

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

Nothing has changed since the last round. Dima and Inna still love each other and want to be together. They've made a deal with Seryozha and now they need to make a deal with the dorm guards...

There are four guardposts in Dima's dorm. Each post contains two guards (in Russia they are usually elderly women). You can bribe a guard by a chocolate bar or a box of juice. For each guard you know the minimum price of the chocolate bar she can accept as a gift and the minimum price of the box of juice she can accept as a gift. If a chocolate bar for some guard costs less than the minimum chocolate bar price for this guard is, or if a box of juice for some guard costs less than the minimum box of juice price for this guard is, then the guard doesn't accept such a gift.

In order to pass through a guardpost, one needs to bribe both guards.

The shop has an unlimited amount of juice and chocolate of any price starting with 1. Dima wants to choose some guardpost, buy one gift for each guard from the guardpost and spend **exactly** n rubles on it.

Help him choose a post through which he can safely sneak Inna or otherwise say that this is impossible. Mind you, Inna would be very sorry to hear that!

Input

The first line of the input contains integer n $(1 \le n \le 10^5)$ — the money Dima wants to spend. Then follow four lines describing the guardposts. Each line contains four integers a, b, c, d $(1 \le a, b, c, d \le 10^5)$ — the minimum price of the chocolate and the minimum price of the juice for the first guard and the minimum price of the chocolate and the minimum price of the juice for the second guard, correspondingly.

Output

In a single line of the output print three space-separated integers: the number of the guardpost, the cost of the first present and the cost of the second present. If there is no guardpost Dima can sneak Inna through at such conditions, print -1 in a single line.

The guardposts are numbered from 1 to 4 according to the order given in the input.

If there are multiple solutions, you can print any of them.

Sample test(s)

input
```
10
5 6 5 6
6 6 7 7
5 8 6 6
9 9 9 9
```
output
```
1 5 5
```

input
```
10
6 6 6 6
7 7 7 7
4 4 4 4
8 8 8 8
```
output
```
3 4 6
```

input
```
5
3 3 3 3
3 3 3 3
3 3 3 3
3 3 3 3
```
output
```
-1
```

Note

Explanation of the first example.

The only way to spend 10 rubles to buy the gifts that won't be less than the minimum prices is to buy two 5 ruble chocolates to both guards from the first guardpost.

Explanation of the second example.

Dima needs 12 rubles for the first guardpost, 14 for the second one, 16 for the fourth one. So the only guardpost we can sneak through is the third one. So, Dima can buy 4 ruble chocolate for the first guard and 6 ruble juice of the second guard.

B. Dima and To-do List

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

You helped Dima to have a great weekend, but it's time to work. Naturally, Dima, as all other men who have girlfriends, does everything wrong.

Inna and Dima are now in one room. Inna tells Dima off for everything he does in her presence. After Inna tells him off for something, she goes to another room, walks there in circles muttering about how useless her sweetheart is. During that time Dima has time to peacefully complete $k - 1$ tasks. Then Inna returns and tells Dima off for the next task he does in her presence and goes to another room again. It continues until Dima is through with his tasks.

Overall, Dima has n tasks to do, each task has a unique number from 1 to n. Dima loves order, so he does tasks consecutively, starting from some task. For example, if Dima has 6 tasks to do in total, then, if he starts from the 5-th task, the order is like that: first Dima does the 5-th task, then the 6-th one, then the 1-st one, then the 2-nd one, then the 3-rd one, then the 4-th one.

Inna tells Dima off (only lovingly and appropriately!) so often and systematically that he's very well learned the power with which she tells him off for each task. Help Dima choose the first task so that in total he gets told off with as little power as possible.

Input

The first line of the input contains two integers n, k $(1 \le k \le n \le 10^5)$. The second line contains n integers $a_1, a_2, ..., a_n$ $(1 \le a_i \le 10^3)$, where a_i is the power Inna tells Dima off with if she is present in the room while he is doing the i-th task.

It is guaranteed that n is divisible by k.

Output

In a single line print the number of the task Dima should start with to get told off with as little power as possible. If there are multiple solutions, print the one with the minimum number of the first task to do.

Sample test(s)

input
6 2 3 2 1 6 5 4
output
1

input
10 5 1 3 5 7 9 9 4 1 8 5
output
3

Note

Explanation of the first example.

If Dima starts from the first task, Inna tells him off with power 3, then Dima can do one more task (as k = 2), then Inna tells him off for the third task with power 1, then she tells him off for the fifth task with power 5. Thus, Dima gets told off with total power 3 + 1 + 5 = 9. If Dima started from the second task, for example, then Inna would tell him off for tasks 2, 4 and 6 with power 2 + 6 + 4 = 12.

Explanation of the second example.

In the second example k = 5, thus, Dima manages to complete 4 tasks in-between the telling off sessions. Thus, Inna tells Dima off for tasks number 1 and 6 (if he starts from 1 or 6), 2 and 7 (if he starts from 2 or 7) and so on. The optimal answer is to start from task 3 or 8, 3 has a smaller number, so the answer is 3.

C. Dima and Salad

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

Dima, Inna and Seryozha have gathered in a room. That's right, someone's got to go. To cheer Seryozha up and inspire him to have a walk, Inna decided to cook something.

Dima and Seryozha have n fruits in the fridge. Each fruit has two parameters: the taste and the number of calories. Inna decided to make a fruit salad, so she wants to take some fruits from the fridge for it. Inna follows a certain principle as she chooses the fruits: the total taste to the total calories ratio of the chosen fruits must equal k. In other words, $\frac{\sum_{j=1}^{m} a_j}{\sum_{j=1}^{m} b_j} = k$, where a_j is the taste of the j-th chosen fruit and b_j is its calories.

Inna hasn't chosen the fruits yet, she is thinking: what is the maximum taste of the chosen fruits if she strictly follows her principle? Help Inna solve this culinary problem — now the happiness of a young couple is in your hands!

Inna loves Dima very much so she wants to make the salad from at least one fruit.

Input

The first line of the input contains two integers n, k $(1 \le n \le 100, 1 \le k \le 10)$. The second line of the input contains n integers $a_1, a_2, ..., a_n$ $(1 \le a_i \le 100)$ — the fruits' tastes. The third line of the input contains n integers $b_1, b_2, ..., b_n$ $(1 \le b_i \le 100)$ — the fruits' calories. Fruit number i has taste a_i and calories b_i.

Output

If there is no way Inna can choose the fruits for the salad, print in the single line number -1. Otherwise, print a single integer — the maximum possible sum of the taste values of the chosen fruits.

Sample test(s)

input
3 2 10 8 1 2 7 1
output
18

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

Note

In the first test sample we can get the total taste of the fruits equal to 18 if we choose fruit number 1 and fruit number 2, then the total calories will equal 9. The condition $\frac{18}{9} = 2 = k$ fulfills, that's exactly what Inna wants.

In the second test sample we cannot choose the fruits so as to follow Inna's principle.

D. Dima and Trap Graph

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

Dima and Inna love spending time together. The problem is, Seryozha isn't too enthusiastic to leave his room for some reason. But Dima and Inna love each other so much that they decided to get criminal...

Dima constructed a trap graph. He shouted: "Hey Seryozha, have a look at my cool graph!" to get his roommate interested and kicked him into the first node.

A trap graph is an undirected graph consisting of n nodes and m edges. For edge number k, Dima denoted a range of integers from l_k to r_k ($l_k \le r_k$). In order to get out of the trap graph, Seryozha initially (before starting his movements) should pick some integer (let's call it x), then Seryozha must go some way from the starting node with number 1 to the final node with number n. At that, Seryozha can go along edge k only if $l_k \le x \le r_k$.

Seryozha is a mathematician. He defined the *loyalty* of some path from the 1-st node to the n-th one as the number of integers x, such that if he initially chooses one of them, he passes the whole path. Help Seryozha find the path of maximum loyalty and return to his room as quickly as possible!

Input

The first line of the input contains two integers n and m ($2 \le n \le 10^3$, $0 \le m \le 3 \cdot 10^3$). Then follow m lines describing the edges. Each line contains four integers a_k, b_k, l_k and r_k ($1 \le a_k, b_k \le n$, $1 \le l_k \le r_k \le 10^6$). The numbers mean that in the trap graph the k-th edge connects nodes a_k and b_k, this edge corresponds to the range of integers from l_k to r_k.

Note that the given graph can have loops and multiple edges.

Output

In a single line of the output print an integer — the maximum loyalty among all paths from the first node to the n-th one. If such paths do not exist or the maximum loyalty equals 0, print in a single line "`Nice work, Dima!`" without the quotes.

Sample test(s)

input

```
4 4
1 2 1 10
2 4 3 5
1 3 1 5
2 4 2 7
```

output

```
6
```

input

```
5 6
1 2 1 10
2 5 11 20
1 4 2 5
1 3 10 11
3 4 12 10000
4 5 6 6
```

output

```
Nice work, Dima!
```

Note

Explanation of the first example.

Overall, we have 2 ways to get from node 1 to node 4: first you must go along the edge 1-2 with range [1-10], then along one of the two edges 2-4.

One of them contains range [3-5], that is, we can pass through with numbers 3, 4, 5. So the loyalty of such path is 3.

If we go along edge 2-4 with range [2-7], then we can pass through with numbers 2, 3, 4, 5, 6, 7. The loyalty is 6. That is the answer.

The edge 1-2 have no influence on the answer because its range includes both ranges of the following edges.

E. Dima and Magic Guitar

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

Dima loves Inna very much. He decided to write a song for her. Dima has a magic guitar with n strings and m frets. Dima makes the guitar produce sounds like that: to play a note, he needs to hold one of the strings on one of the frets and then pull the string. When Dima pulls the i-th string holding it on the j-th fret the guitar produces a note, let's denote it as a_{ij}. We know that Dima's guitar can produce k distinct notes. It is possible that some notes can be produced in multiple ways. In other words, it is possible that $a_{ij} = a_{pq}$ at $(i, j) \neq (p, q)$.

Dima has already written a song — a sequence of s notes. In order to play the song, you need to consecutively produce the notes from the song on the guitar. You can produce each note in any available way. Dima understood that there are many ways to play a song and he wants to play it so as to make the song look as complicated as possible (try to act like Cobein).

We'll represent a way to play a song as a sequence of pairs (x_i, y_i) $(1 \leq i \leq s)$, such that the x_i-th string on the y_i-th fret produces the i-th note from the song. The complexity of moving between pairs (x_1, y_1) and (x_2, y_2) equals $|x_1 - x_2| + |y_1 - y_2|$. The complexity of a way to play a song is the maximum of complexities of moving between adjacent pairs.

Help Dima determine the maximum complexity of the way to play his song! The guy's gotta look cool!

Input

The first line of the input contains four integers n, m, k and s $(1 \leq n, m \leq 2000, 1 \leq k \leq 9, 2 \leq s \leq 10^5)$.

Then follow n lines, each containing m integers a_{ij} $(1 \leq a_{ij} \leq k)$. The number in the i-th row and the j-th column (a_{ij}) means a note that the guitar produces on the i-th string and the j-th fret.

The last line of the input contains s integers q_i $(1 \leq q_i \leq k)$ — the sequence of notes of the song.

Output

In a single line print a single number — the maximum possible complexity of the song.

Sample test(s)

input

```
4 6 5 7
3 1 2 2 3 1
3 2 2 2 5 5
4 2 2 2 5 3
3 2 2 1 4 3
2 3 1 4 1 5 1
```

output

```
8
```

input

```
4 4 9 5
4 7 9 5
1 2 1 7
8 3 4 9
5 7 7 2
7 1 9 2 5
```

output

```
4
```