Codeforces Round #419 (Div. 1)

A. Karen and Game

time limit per test: 2 seconds
memory limit per test: 512 megabytes
input: standard input
output: standard output

On the way to school, Karen became fixated on the puzzle game on her phone!

The game is played as follows. In each level, you have a grid with n rows and m columns. Each cell originally contains the number 0.

One move consists of choosing one row or column, and adding 1 to all of the cells in that row or column.

To win the level, after all the moves, the number in the cell at the i-th row and j-th column should be equal to $g_{i,j}$.

Karen is stuck on one level, and wants to know a way to beat this level using the minimum number of moves. Please, help her with this task!

Input

The first line of input contains two integers, n and m ($1 \le n, m \le 100$), the number of rows and the number of columns in the grid, respectively.

The next n lines each contain m integers. In particular, the j-th integer in the i-th of these rows contains $g_{i,j}$ ($0 \le g_{i,j} \le 500$).

Output

If there is an error and it is actually not possible to beat the level, output a single integer `-1`.

Otherwise, on the first line, output a single integer k, the minimum number of moves necessary to beat the level.

The next k lines should each contain one of the following, describing the moves in the order they must be done:

- `row` x, ($1 \le x \le n$) describing a move of the form "choose the x-th row".
- `col` x, ($1 \le x \le m$) describing a move of the form "choose the x-th column".

If there are multiple optimal solutions, output any one of them.

Examples

input
3 5 2 2 2 3 2 0 0 0 1 0 1 1 1 2 1

output
4 row 1 row 1 col 4 row 3

input
3 3 0 0 0

```
0 1 0
0 0 0
```

output

```
-1
```

input

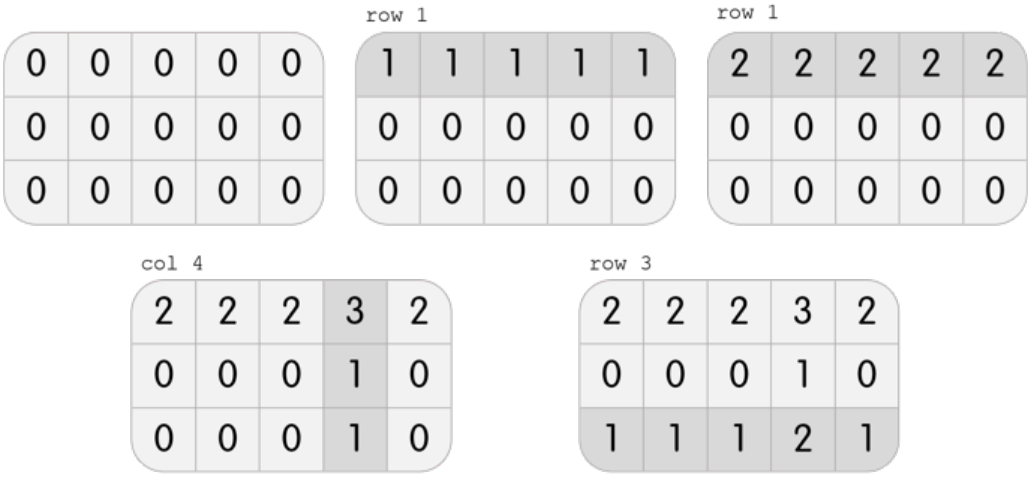
```
3 3
1 1 1
1 1 1
1 1 1
```

output

```
3
row 1
row 2
row 3
```

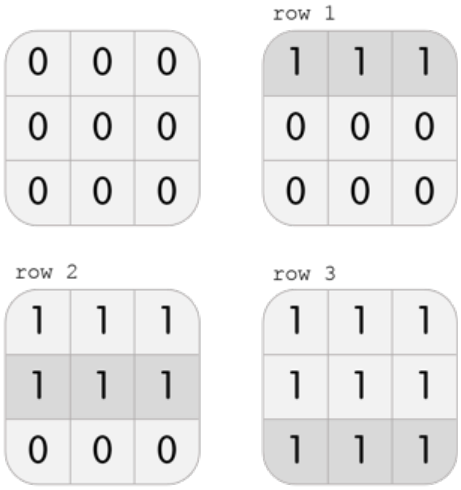
Note

In the first test case, Karen has a grid with 3 rows and 5 columns. She can perform the following 4 moves to beat the level:



In the second test case, Karen has a grid with 3 rows and 3 columns. It is clear that it is impossible to beat the level; performing any move will create three 1s on the grid, but it is required to only have one 1 in the center.

In the third test case, Karen has a grid with 3 rows and 3 columns. She can perform the following 3 moves to beat the level:



Note that this is not the only solution; another solution, among others, is `col 1`, `col 2`, `col 3`.

B. Karen and Test

time limit per test: 2 seconds
memory limit per test: 512 megabytes
input: standard input
output: standard output

Karen has just arrived at school, and she has a math test today!

The test is about basic addition and subtraction. Unfortunately, the teachers were too busy writing tasks for Codeforces rounds, and had no time to make an actual test. So, they just put one question in the test that is worth all the points.

There are n integers written on a row. Karen must alternately add and subtract each pair of adjacent integers, and write down the sums or differences on the next row. She must repeat this process on the values on the next row, and so on, until only one integer remains. The first operation should be addition.

Note that, if she ended the previous row by adding the integers, she should start the next row by subtracting, and vice versa.

The teachers will simply look at the last integer, and then if it is correct, Karen gets a perfect score, otherwise, she gets a zero for the test.

Karen has studied well for this test, but she is scared that she might make a mistake somewhere and it will cause her final answer to be wrong. If the process is followed, what number can she expect to be written on the last row?

Since this number can be quite large, output only the non-negative remainder after dividing it by $10^9 + 7$.

Input

The first line of input contains a single integer n ($1 \le n \le 200000$), the number of numbers written on the first row.

The next line contains n integers. Specifically, the i-th one among these is a_i ($1 \le a_i \le 10^9$), the i-th number on the first row.

Output

Output a single integer on a line by itself, the number on the final row after performing the process above.

Since this number can be quite large, print only the non-negative remainder after dividing it by $10^9 + 7$.

Examples

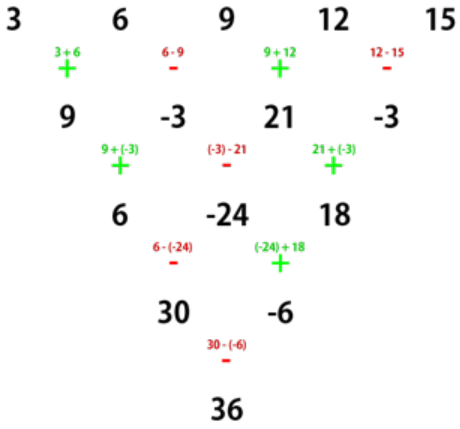
input
5 3 6 9 12 15
output
36

input
4 3 7 5 2
output
1000000006

Note

In the first test case, the numbers written on the first row are 3, 6, 9, 12 and 15.

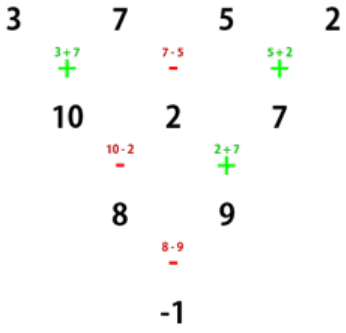
Karen performs the operations as follows:



The non-negative remainder after dividing the final number by $10^9 + 7$ is still 36, so this is the correct output.

In the second test case, the numbers written on the first row are 3, 7, 5 and 2.

Karen performs the operations as follows:



The non-negative remainder after dividing the final number by $10^9 + 7$ is $10^9 + 6$, so this is the correct output.

C. Karen and Supermarket

time limit per test: 2 seconds
memory limit per test: 512 megabytes
input: standard input
output: standard output

On the way home, Karen decided to stop by the supermarket to buy some groceries.

She needs to buy a lot of goods, but since she is a student her budget is still quite limited. In fact, she can only spend up to b dollars.

The supermarket sells n goods. The i-th good can be bought for c_i dollars. Of course, each good can only be bought once.

Lately, the supermarket has been trying to increase its business. Karen, being a loyal customer, was given n coupons. If Karen purchases the i-th good, she can use the i-th coupon to decrease its price by d_i. Of course, a coupon cannot be used without buying the corresponding good.

There is, however, a constraint with the coupons. For all $i \geq 2$, in order to use the i-th coupon, Karen must also use the x_i-th coupon (which may mean using even more coupons to satisfy the requirement for that coupon).

Karen wants to know the following. What is the maximum number of goods she can buy, without exceeding her budget b?

Input

The first line of input contains two integers n and b ($1 \leq n \leq 5000$, $1 \leq b \leq 10^9$), the number of goods in the store and the amount of money Karen has, respectively.

The next n lines describe the items. Specifically:

- The i-th line among these starts with two integers, c_i and d_i ($1 \leq d_i < c_i \leq 10^9$), the price of the i-th good and the discount when using the coupon for the i-th good, respectively.
- If $i \geq 2$, this is followed by another integer, x_i ($1 \leq x_i < i$), denoting that the x_i-th coupon must also be used before this coupon can be used.

Output

Output a single integer on a line by itself, the number of different goods Karen can buy, without exceeding her budget.

Examples

input
6 16 10 9 10 5 1 12 2 1 20 18 3 10 2 3 2 1 5
output
4

input
5 10 3 1 3 1 1 3 1 2 3 1 3 3 1 4
output
5

Note

In the first test case, Karen can purchase the following 4 items:

- Use the first coupon to buy the first item for $10 - 9 = 1$ dollar.
- Use the third coupon to buy the third item for $12 - 2 = 10$ dollars.
- Use the fourth coupon to buy the fourth item for $20 - 18 = 2$ dollars.
- Buy the sixth item for 2 dollars.

The total cost of these goods is 15, which falls within her budget. Note, for example, that she cannot use the coupon on the sixth item, because then she should have also used the fifth coupon to buy the fifth item, which she did not do here.

In the second test case, Karen has enough money to use all the coupons and purchase everything.

D. Karen and Cards

time limit per test: 2 seconds
memory limit per test: 512 megabytes
input: standard input
output: standard output

Karen just got home from the supermarket, and is getting ready to go to sleep.

After taking a shower and changing into her pajamas, she looked at her shelf and saw an album. Curious, she opened it and saw a trading card collection.

She recalled that she used to play with those cards as a child, and, although she is now grown-up, she still wonders a few things about it.

Each card has three characteristics: *strength*, *defense* and *speed*. The values of all characteristics of all cards are positive integers. The maximum possible strength any card can have is p, the maximum possible defense is q and the maximum possible speed is r.

There are n cards in her collection. The i-th card has a strength a_i, defense b_i and speed c_i, respectively.

A card *beats* another card if at least two of its characteristics are *strictly greater* than the corresponding characteristics of the other card.

She now wonders how many different cards can beat all the cards in her collection. Two cards are considered different if at least one of their characteristics have different values.

Input

The first line of input contains four integers, n, p, q and r ($1 \le n, p, q, r \le 500000$), the number of cards in the collection, the maximum possible strength, the maximum possible defense, and the maximum possible speed, respectively.

The next n lines each contain three integers. In particular, the i-th line contains a_i, b_i and c_i ($1 \le a_i \le p$, $1 \le b_i \le q$, $1 \le c_i \le r$), the strength, defense and speed of the i-th collection card, respectively.

Output

Output a single integer on a line by itself, the number of different cards that can beat all the cards in her collection.

Examples

input
3 4 4 5 2 2 5 1 3 4 4 1 1
output
10

input
5 10 10 10 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
output
972

Note

In the first test case, the maximum possible strength is 4, the maximum possible defense is 4 and the maximum possible speed is 5. Karen has three cards:

- The first card has strength 2, defense 2 and speed 5.
- The second card has strength 1, defense 3 and speed 4.
- The third card has strength 4, defense 1 and speed 1.

There are 10 cards that beat all the cards here:

1. The card with strength 3, defense 3 and speed 5.
2. The card with strength 3, defense 4 and speed 2.
3. The card with strength 3, defense 4 and speed 3.
4. The card with strength 3, defense 4 and speed 4.
5. The card with strength 3, defense 4 and speed 5.
6. The card with strength 4, defense 3 and speed 5.
7. The card with strength 4, defense 4 and speed 2.
8. The card with strength 4, defense 4 and speed 3.
9. The card with strength 4, defense 4 and speed 4.
10. The card with strength 4, defense 4 and speed 5.

In the second test case, the maximum possible strength is 10, the maximum possible defense is 10 and the maximum possible speed is 10. Karen has five cards, all with strength 1, defense 1 and speed 1.

Any of the 972 cards which have at least two characteristics greater than 1 can beat all of the cards in her collection.

E. Karen and Neighborhood

time limit per test: 2 seconds
memory limit per test: 512 megabytes
input: standard input
output: standard output

It's been long after the events of the previous problems, and Karen has now moved on from student life and is looking to relocate to a new neighborhood.

The neighborhood consists of n houses in a straight line, labelled 1 to n from left to right, all an equal distance apart.

Everyone in this neighborhood loves peace and quiet. Because of this, whenever a new person moves into the neighborhood, he or she always chooses the house whose minimum distance to any occupied house is maximized. If there are multiple houses with the maximum possible minimum distance, he or she chooses the leftmost one.

Note that the first person to arrive always moves into house 1.

Karen is the k-th person to enter this neighborhood. If everyone, including herself, follows this rule, which house will she move into?

Input

The first and only line of input contains two integers, n and k ($1 \leq k \leq n \leq 10^{18}$), describing the number of houses in the neighborhood, and that Karen was the k-th person to move in, respectively.

Output

Output a single integer on a line by itself, the label of the house Karen will move into.

Examples

input
6 4
output
2

input
39 3
output
20

Note

In the first test case, there are 6 houses in the neighborhood, and Karen is the fourth person to move in:

1. The first person moves into house 1.
2. The second person moves into house 6.
3. The third person moves into house 3.
4. The fourth person moves into house 2.

In the second test case, there are 39 houses in the neighborhood, and Karen is the third person to move in:

1. The first person moves into house 1.
2. The second person moves into house 39.
3. The third person moves into house 20.