Codeforces Round #415 (Div. 2)

A. Straight «A»

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

Noora is a student of one famous high school. It's her final year in school — she is going to study in university next year. However, she has to get an «A» graduation certificate in order to apply to a prestigious one.

In school, where Noora is studying, teachers are putting down marks to the online class register, which are integers from 1 to k. The worst mark is 1, the best is k. Mark that is going to the certificate, is calculated as an average of all the marks, rounded to the closest integer. If several answers are possible, rounding up is produced. For example, 7.3 is rounded to 7, but 7.5 and 7.8784 — to 8.

For instance, if Noora has marks $[8, 9]$, then the mark to the certificate is 9, because the average is equal to 8.5 and rounded to 9, but if the marks are $[8, 8, 9]$, Noora will have graduation certificate with 8.

To graduate with «A» certificate, Noora **has to have mark** k.

Noora got n marks in register this year. However, she is afraid that her marks are not enough to get final mark k. Noora decided to ask for help in the internet, where hacker Leha immediately responded to her request. He is ready to hack class register for Noora and to add Noora any number of additional marks from 1 to k. At the same time, Leha want his hack be unseen to everyone, so he decided to add as less as possible additional marks. Please help Leha to calculate the minimal number of marks he has to add, so that final Noora's mark will become equal to k.

Input

The first line contains two integers n and k ($1 \le n \le 100$, $1 \le k \le 100$) denoting the number of marks, received by Noora and the value of highest possible mark.

The second line contains n integers a_1, a_2, ..., a_n ($1 \le a_i \le k$) denoting marks received by Noora before Leha's hack.

Output

Print a single integer — minimal number of additional marks, that Leha has to add in order to change Noora's final mark to k.

Examples

input
2 10 8 9

output
4

input
3 5 4 4 4

output
3

Note

Consider the first example testcase.

Maximal mark is 10, Noora received two marks — 8 and 9, so current final mark is 9. To fix it, Leha can add marks $[10, 10, 10, 10]$ (4 marks in total) to the registry, achieving Noora having average mark equal to $\frac{8+9+10+10+10+10}{6} = \frac{57}{6} = 9.5$. Consequently, new final mark is 10. Less number of marks won't fix the situation.

In the second example Leha can add $[5, 5, 5]$ to the registry, so that making average mark equal to 4.5, which is enough to have 5 in the certificate.

B. Summer sell-off

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

Summer holidays! Someone is going on trips, someone is visiting grandparents, but someone is trying to get a part-time job. This summer Noora decided that she wants to earn some money, and took a job in a shop as an assistant.

Shop, where Noora is working, has a plan on the following n days. For each day sales manager knows exactly, that in i-th day k_i products will be put up for sale and exactly l_i clients will come to the shop that day. Also, the manager is sure, that everyone, who comes to the shop, buys exactly one product or, if there aren't any left, leaves the shop without buying anything. Moreover, due to the short shelf-life of the products, manager established the following rule: if some part of the products left on the shelves at the end of the day, that products aren't kept on the next day and are sent to the dump.

For advertising purposes manager offered to start a sell-out in the shop. He asked Noora to choose any f days from n next for sell-outs. On each of f chosen days the number of products were put up for sale would be doubled. Thus, if on i-th day shop planned to put up for sale k_i products and Noora has chosen this day for sell-out, shelves of the shop would keep $2 \cdot k_i$ products. Consequently, there is an opportunity to sell two times more products on days of sell-out.

Noora's task is to choose f days to maximize total number of sold products. She asks you to help her with such a difficult problem.

Input

The first line contains two integers n and f ($1 \le n \le 10^5$, $0 \le f \le n$) denoting the number of days in shop's plan and the number of days that Noora has to choose for sell-out.

Each line of the following n subsequent lines contains two integers k_i, l_i ($0 \le k_i$, $l_i \le 10^9$) denoting the number of products on the shelves of the shop on the i-th day and the number of clients that will come to the shop on i-th day.

Output

Print a single integer denoting the maximal number of products that shop can sell.

Examples

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

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

Note

In the first example we can choose days with numbers 2 and 4 for sell-out. In this case new numbers of products for sale would be equal to $[2, 6, 2, 2]$ respectively. So on the first day shop will sell 1 product, on the second — 5, on the third — 2, on the fourth — 2. In total $1 + 5 + 2 + 2 = 10$ product units.

In the second example it is possible to sell 5 products, if you choose third day for sell-out.

C. Do you want a date?

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

Leha decided to move to a quiet town Vičkopolis, because he was tired by living in Bankopolis. Upon arrival he immediately began to expand his network of hacked computers. During the week Leha managed to get access to n computers throughout the town. Incidentally all the computers, which were hacked by Leha, lie on the same straight line, due to the reason that there is the only one straight street in Vičkopolis.

Let's denote the coordinate system on this street. Besides let's number all the hacked computers with integers from 1 to n. So the i-th hacked computer is located at the point x_i. Moreover the coordinates of all computers are distinct.

Leha is determined to have a little rest after a hard week. Therefore he is going to invite his friend Noora to a restaurant. However the girl agrees to go on a date with the only one condition: Leha have to solve a simple task.

Leha should calculate a sum of $F(a)$ for all a, where a is a non-empty subset of the set, that consists of all hacked computers. Formally, let's denote A the set of all integers from 1 to n. Noora asks the hacker to find value of the expression $\sum_{a \subseteq A, a \neq \varnothing} F(a)$. Here $F(a)$ is calculated as the maximum among the distances between all pairs of computers from the set a. Formally, $F(a) = \max_{i,j \in a} |x_i - x_j|$. Since the required sum can be quite large Noora asks to find it modulo $10^9 + 7$.

Though, Leha is too tired. Consequently he is not able to solve this task. Help the hacker to attend a date.

Input

The first line contains one integer n $(1 \le n \le 3 \cdot 10^5)$ denoting the number of hacked computers.

The second line contains n integers $x_1, x_2, \ldots, x_n$ $(1 \le x_i \le 10^9)$ denoting the coordinates of hacked computers. It is guaranteed that all x_i are distinct.

Output

Print a single integer — the required sum modulo $10^9 + 7$.

Examples

input
2 4 7
output
3

input
3 4 3 1
output
9

Note

There are three non-empty subsets in the first sample test:$\{4\}$, $\{7\}$ and $\{4, 7\}$. The first and the second subset increase the sum by 0 and the third subset increases the sum by $7 - 4 = 3$. In total the answer is $0 + 0 + 3 = 3$.

There are seven non-empty subsets in the second sample test. Among them only the following subsets increase the answer: $\{4, 3\}$, $\{4, 1\}$, $\{3, 1\}$, $\{4, 3, 1\}$. In total the sum is $(4 - 3) + (4 - 1) + (3 - 1) + (4 - 1) = 9$.

D. Glad to see you!

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

This is an interactive problem. In the output section below you will see the information about flushing the output.

On Sunday Leha the hacker took Nura from the house where she lives and went with her to one of the most luxurious restaurants in Vičkopolis. Upon arrival, they left the car in a huge parking lot near the restaurant and hurried inside the building.

In the restaurant a polite waiter immediately brought the menu to Leha and Noora, consisting of n dishes. It is interesting that all dishes in the menu are numbered with integers from 1 to n. After a little thought, the girl ordered exactly k different dishes from available in the menu. To pass the waiting time while the chefs prepare ordered dishes, the girl invited the hacker to play a game that will help them get to know each other better.

The game itself is very simple: Noora wants Leha to guess any two dishes among all ordered. At the same time, she is ready to answer only one type of questions. Leha can say two numbers x and y ($1 \le x, y \le n$). After that Noora chooses some dish a for the number x such that, at first, a is among the dishes Noora ordered (x can be equal to a), and, secondly, the value $|x - a|$ is the minimum possible. By the same rules the girl chooses dish b for y. After that Noora says «TAK» to Leha, if $|x - a| \le |y - b|$, and «NIE» otherwise. However, the restaurant is preparing quickly, so Leha has enough time to ask no more than 60 questions. After that he should name numbers of any two dishes Noora ordered.

Help Leha to solve this problem!

Input

There are two numbers n and k ($2 \le k \le n \le 10^5$) in the single line of input denoting the number of dishes in the menu and the number of dishes Noora ordered.

Output

If you want to provide an answer, output a string of the form $2\ x\ y$ ($1 \le x, y \le n, x \ne y$), if you think the dishes x and y was among dishes ordered by Noora. After that, flush the output and terminate your program.

Interaction

While helping Leha, you can ask queries to Noora no more than 60 times. Each query should be printed in it's own line and have the form $1\ x\ y$ ($1 \le x, y \le n$). You have to both print the end-of-line character and flush the output. After flushing you should read the answer for this query from input.

After each query jury's program will print one line «TAK» or «NIE» (without quotes) in input stream depending on the girl's answer.

To flush you can use (just after printing an integer and end-of-line):

- `fflush(stdout)` in C++;
- `System.out.flush()` in Java;
- `stdout.flush()` in Python;
- `flush(output)` in Pascal;
- see the documentation for other languages.

Hacking

For hacking you should write numbers n and k ($2 \le k \le n \le 10^5$) in the first line and, for describing dishes Noora ordered, k different integers $a_1, a_2, \ldots, a_k$ ($1 \le a_i \le n$), *written in ascending order* in the second line. Of course, solution you want to hack won't be able to read the numbers of ordered dishes.

Example

input
3 2 NIE TAK NIE TAK TAK TAK

output
1 1 2 1 2 1 1 1 3 1 3 1 1 2 3 1 3 2 2 2 3

Note

There are three dishes in sample. Noora ordered dished numberes 2 and 3, which Leha should guess. If Noora receive requests for the first dish ($x = 1$), then she'll choose the second dish ($a = 2$) as the dish with the minimum value $|x - a|$. For the second ($x = 2$) and the third ($x = 3$) dishes themselves will be optimal, because in that case $|x - a| = 0$.

Let Leha asks Noora about the next couple of dishes:

- $x = 1, y = 2$, then he'll recieve «NIE» answer, because $|1 - 2| > |2 - 2|$
- $x = 2, y = 1$, then he'll recieve «TAK» answer, because $|2 - 2| \leq |1 - 2|$
- $x = 1, y = 3$, then he'll recieve «NIE» answer, because $|1 - 2| > |3 - 3|$
- $x = 3, y = 1$, then he'll recieve «TAK» answer, because $|3 - 3| \leq |1 - 2|$
- $x = 2, y = 3$, then he'll recieve «TAK» answer, because $|2 - 2| \leq |3 - 3|$
- $x = 3, y = 2$, then he'll recieve «TAK» answer, because $|3 - 3| \leq |2 - 2|$

According to the available information, it is possible to say that Nura ordered dishes with numbers 2 and 3.

E. Find a car

time limit per test: 4 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

After a wonderful evening in the restaurant the time to go home came. Leha as a true gentlemen suggested Noora to give her a lift. Certainly the girl agreed with pleasure. Suddenly one problem appeared: Leha cannot find his car on a huge parking near the restaurant. So he decided to turn to the watchman for help.

Formally the parking can be represented as a matrix $10^9 \times 10^9$. There is exactly one car in every cell of the matrix. All cars have their own machine numbers represented as a positive integer. Let's index the columns of the matrix by integers from 1 to 10^9 from left to right and the rows by integers from 1 to 10^9 from top to bottom. By coincidence it turned out, that for every cell (x, y) the number of the car, which stands in this cell, is equal to the minimum positive integer, which can't be found in the cells (i, y) and (x, j), $1 \le i < x$, $1 \le j < y$.

1	2	3	4	5
2	1	4	3	6
3	4	1	2	7
4	3	2	1	8
5	6	7	8	1

The upper left fragment 5×5 of the parking

Leha wants to ask the watchman q requests, which can help him to find his car. Every request is represented as five integers x_1, y_1, x_2, y_2, k. The watchman have to consider all cells (x, y) of the matrix, such that $x_1 \le x \le x_2$ and $y_1 \le y \le y_2$, and if the number of the car in cell (x, y) does not exceed k, increase the answer to the request by the number of the car in cell (x, y). For each request Leha asks the watchman to tell him the resulting sum. Due to the fact that the sum can turn out to be quite large, hacker asks to calculate it modulo $10^9 + 7$.

However the requests seem to be impracticable for the watchman. Help the watchman to answer all Leha's requests.

Input

The first line contains one integer q $(1 \le q \le 10^4)$ — the number of Leha's requests.

The next q lines contain five integers x_1, y_1, x_2, y_2, k $(1 \le x_1 \le x_2 \le 10^9, 1 \le y_1 \le y_2 \le 10^9, 1 \le k \le 2 \cdot 10^9)$ — parameters of Leha's requests.

Output

Print exactly q lines — in the first line print the answer to the first request, in the second — the answer to the second request and so on.

Example

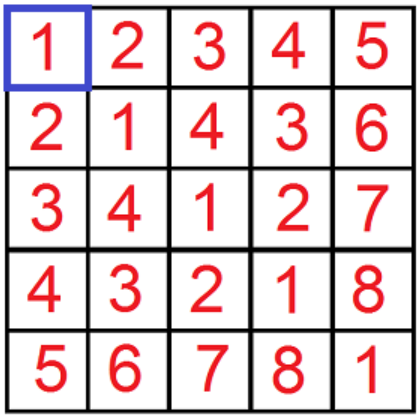
input
4 1 1 1 1 1 3 2 5 4 5 1 1 5 5 10000 1 4 2 5 2

output
1 13 93 0

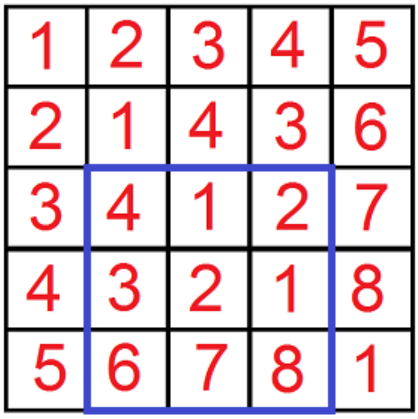
Note

Let's analyze all the requests. In each case the requested submatrix is highlighted in blue.

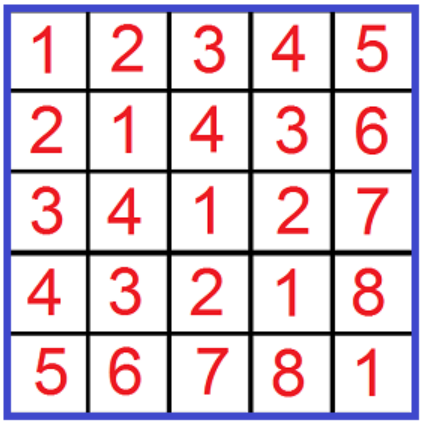
In the first request $(k = 1)$ Leha asks only about the upper left parking cell. In this cell the car's number is 1. Consequentally the answer is 1.



In the second request ($k = 5$) suitable numbers are $4, 1, 2, 3, 2, 1$. Consequentally the answer is $4 + 1 + 2 + 3 + 2 + 1 = 13$.



In the third request ($k = 10000$) Leha asks about the upper left frament 5×5 of the parking. Since k is big enough, the answer is equal to 93.



In the last request ($k = 2$) none of the cur's numbers are suitable, so the answer is 0.