A. Brackets

A template is a mathematical expression w contains four basic operations, parentheses, and the number of places. For example, `(x*x)/(x+x)` is a template.

We call such a valuation of real numbers to insert into the template that the value created in this way an expression is defined. Substituting $1, 2, 3, 4$ followed in the example above, we get the expression value $(1 \cdot 2)/(3 + 4) = \frac{2}{7}$, while inserting $1, 2, 3, -3$ is not a valuation.

If the template sets of values w and w' are the same and for any valuation resulting from the expression w and w' have the same values and the template w' is created by adding and/or remove the brackets from the template w, we say that the templates are equivalent. For example templates `(x*x)/(x+x)` and `x*x/(x+x)` are equivalent. Template `(x*x)/(x+x)` and `x*x/x+x` are not equivalent, because the valuation $1, 2, 3, 4$ gives the expression of values $\frac{2}{7}$ and $4\frac{2}{3}$. Templates `x-(x-x)` and `x-x+x` are not equivalent because it can not be reduced to one another by adding and removing the brackets.

The task is to find the template with the minimum number of brackets, equivalent to that template.

Multiplication and division have the same priority, larger than the addition and subtraction, multiplication and division, therefore, are performed before addition and subtraction. Addition and subtraction have the same priority. The operations of the same priority are performed from left to right.

Input

The first line of input contains the number of n denoting the number of expressions. In each of subsequent n lines, contains a correct template consisting of characters +, -, *, /, (,) and x (representing a number). Every template has length no longer than 10^6 characters.

Output

Output n lines containing the reduced equivalent template with minimum number of parentheses.

Sample Input

```
2
x+(x+(x+x)-(x*x))/x
(x*x)/((x*x))+(x)
```

Sample Output

```
x+(x+x+x-x*x)/x
x*x/(x*x)+x
```

(Almost empty page.)

B. Safe

Ke1vin want to test a new type of safe: combinatorial. It has a wheel of n buttons on it, numbered from 0 to $n-1$. For some subset of the buttons, any of them will cause the safe open, while others don't. Pipi noticed another important thing: if both x-th and y-th are the buttons will cause the safe open, so does button number $(x+y) \bmod n$.

Ke1vin has checked k different buttons: $m_1, m_2, \ldots, m_k$. After pushed button number $m_1, m_2, \ldots, m_{k-1}$ the safe didn't open. But pushed button number m_k caused the safe open. Seanwu would like to know, based on the knowledge gained so far, what is the possible maximum number of buttons that will cause the safe open?

Input

There are multiple test cases in the input file terminated by EOF. For each test case, first line contains two integers n and k with $1 \leq k \leq 250000$ and $k \leq n \leq 10^{14}$. The second line contains k different integers, seperated by single spaces, $m_1, m_2, \ldots, m_k$, $0 \leq m_i < n$. You may assume that there will be always a solution for each test case.

Output

For each test case please output the answer in a line.

Sample Input

```
42 5
28 31 10 38 24
42 5
28 31 10 38 24
```

Sample Output

```
14
14
```

(Almost empty page.)

C. Chess

Brian the Rabbit adores chess. Not long ago he argued with Stewie the Rabbit that a knight is better than a king. To prove his point he tries to show that the knight is very fast but Stewie doesn't accept statements without evidence. He constructed an infinite chessboard for Brian, where he deleted several squares to add some more interest to the game. Brian only needs to count how many different board squares a knight standing on a square with coordinates of $(0, 0)$ can reach in no more than k moves. Naturally, it is forbidden to move to the deleted squares.

Brian doesn't very much like exact sciences himself and is not acquainted with programming, that's why he will hardly be able to get ahead of Stewie who has already started solving the problem. Help Brian to solve the problem faster than Stewie.

Input

There are multiple test cases in the input file terminated by EOF. For each test case:

The first line contains two integers k and n ($0 \le k \le 10^{18}, 0 \le n \le 440$) which are correspondingly the maximal number of moves a knight can make and the number of deleted cells. Then follow n lines, each giving the coordinates of a deleted square in the form (x_i, y_i) ($|x_i| \le 10, |y_i| \le 10$). All the numbers are integer, the deleted squares are different and it is guaranteed that the square $(0, 0)$ is not deleted.

Output

You must print each answer on a single line. As it can be rather long, you should print it modulo 1000000007.

Sample Input

```
1 0

2 7
-1 2
1 2
2 1
2 -1
1 -2
-1 -2
-2 -1
```

Sample Output

```
9
9
```

(Almost empty page.)

D. DravDe saves the world

How horrible! The empire of galactic chickens tries to conquer a beautiful city Z, they have built a huge incubator that produces millions of chicken soldiers a day, and fenced it around. The huge incubator looks like a polygon on the the plane Oxy with n vertices. Naturally, DravDe can't keep still, he wants to destroy the chicken empire. For sure, he will start with the incubator.

DravDe is strictly outside the incubator's territory in point $A(x_a, y_a)$, and wants to get inside and kill all the chickens working there. But it takes a lot of doing! The problem is that recently DravDe went roller skating and has broken both his legs. He will get to the incubator's territory in his jet airplane LEVAP-41.

LEVAP-41 flies at speed $V(x_v, y_v, z_v)$. DravDe can get on the plane in point A, fly for some time, and then air drop himself. DravDe is very heavy, that's why he falls vertically at speed F_{down}, but in each point of his free fall DravDe can open his parachute, and from that moment he starts to fall at the wind speed $U(x_u, y_u, z_u)$ until he lands. Unfortunately, DravDe isn't good at mathematics. Would you help poor world's saviour find such an air dropping plan, that allows him to land on the incubator's territory? If the answer is not unique, DravDe wants to find the plan with the minimum time of his flight on the plane. If the answers are still multiple, he wants to find the one with the minimum time of his free fall before opening his parachute.

Input

There are multiple test cases in the input file terminated by EOF. For each test case:

The first line contains number n ($3 \le n \le 10^4$) — amount of vertices of the fence. Then there follow n lines containing the coordinates of these vertices (two integer numbers x_i, y_i) in clockwise or counter-clockwise order. It's guaranteed, that the fence does not contain self-intersections.

The following four lines contain coordinates of point $A(x_a, y_a)$, speeds $V(x_v, y_v, z_v)$, F_{down} and speed $U(x_u, y_u, z_u)$. All the input numbers are integer. All the coordinates don't exceed 10^4 in absolute value. It's guaranteed, that $z_v > 0$ and $F_{down}, z_u < 0$, and point A is strictly outside the incubator's territory.

Output

For each test case output two numbers t_1, t_2 such that if DravDe air drops at time t_1 (counting from the beginning of the flight), he lands on the incubator's territory (landing on the border is regarder as landing on the territory). If DravDe doesn't open his parachute, the second number should be equal to the duration of DravDe's falling down. If it's impossible for DravDe to get to the incubator's territory, output `-1 -1`. If the answer is not unique, output the answer with the minimum t_1. If the answers are still multiple, output the answer with the minimum t_2.

Sample Input

```
4
0 0
1 0
1 1
0 1
0 -1
1 0 1
-1
0 1 -1

4
0 0
0 1
1 1
1 0
0 -1
-1 -1 1
-1
0 1 -1

4
0 0
1 0
1 1
0 1
0 -1
1 1 1
-1
1 1 -1
```

Sample Output

```
1.00000000 0.00000000
-1.00000000 -1.00000000
0.50000000 0.00000000
```

E. Expression

One day Vasya was solving arithmetical problems. He wrote down an expression $a+b=c$ in his notebook. When the teacher checked Vasya's work it turned out that Vasya had solved the problem incorrectly. Now Vasya tries to find excuses. He says that he simply forgot to write down several digits in numbers a, b and c, but he can't remember what numbers they actually were. Help Vasya, find such numbers x, y and z, with which the following conditions are met:

- $x + y = z$,
- from the expression $x + y = z$ several digits can be erased in such a way that the result will be $a + b = c$,
- the expression $x + y = z$ should have the minimal length.

Input

There are multiple test cases in the input file terminated by EOF. For each test case:

The first and only input line contains the expression $a + b = c$ ($1 \leq a, b, c \leq 10^6$, a, b and c don't contain leading zeroes) which is the expression Vasya wrote down.

Output

Print the correct expression $x + y = z$ (x, y and z are non-negative numbers without leading zeroes). The expression $a + b = c$ must be met in $x + y = z$ as a subsequence. The printed solution should have the minimal possible number of characters. If there are several such solutions, you can print any of them.

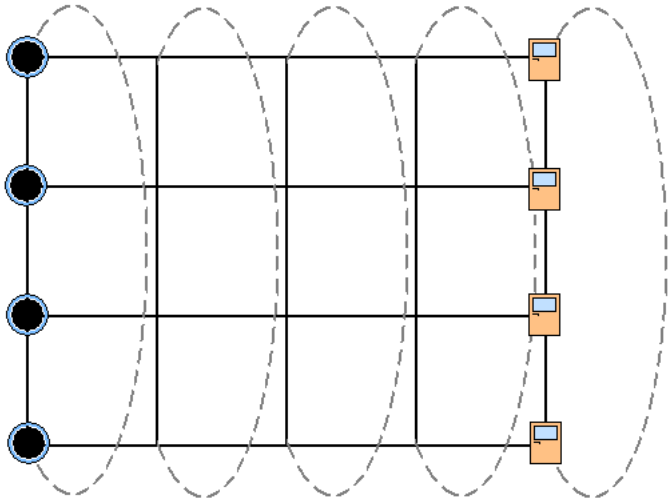
Sample Input	Sample Output
2+4=5 1+1=3 1+1=2	21+4=25 1+31=32 1+1=2

(Almost empty page.)

F. World Evil

As a result of Pinky and Brain's mysterious experiments in the Large Hadron Collider some portals or black holes opened to the parallel dimension. And the World Evil has crept to the veil between their world and ours. Brain quickly evaluated the situation and he understood that the more evil tentacles creep out and become free, the higher is the possibility that Brain will rule the world.

The collider's constriction is a rectangular grid rolled into a cylinder and consisting of n rows and m columns such as is shown in the picture below:



In this example $n = 4, m = 5$. Dotted lines are corridores that close each column to a ring, i.e. connect the n-th and the 1-th rows of the grid.

In the leftmost column of the grid the portals are situated and the tentacles of the World Evil are ready to creep out from there. In the rightmost column the exit doors are located. The tentacles can only get out through those doors. The segments joining the nodes of the grid are corridors.

Brain would be glad to let all the tentacles out but he faces a problem: the infinite number of tentacles can creep out of the portals, every tentacle possesses infinite length and some width and the volume of the corridors are, unfortunately, quite limited. Brain could approximately evaluate the maximal number of tentacles that will be able to crawl through every corridor.

Now help the mice to determine the maximal number of tentacles of the World Evil that will crawl out of the Large Hadron Collider.

Input

There are multiple test cases in the input file terminated by EOF. For each test case:

The first line of the input file contains two integers n and m ($2 \leq n \leq 5, 2 \leq m \leq 10^5$). They are the sizes of the Large Hadron Collider grid. The next $m-1$ lines contain n numbers each. They are the horizontal corridors' capacities. The next m lines contain n numbers each. They are the vertical corridors' capacities. Corridors are described from left to right and from top to bottom. Every n-th vertical corridor connects nodes of the n-th and 1-th rows. A corridor's capacity is a non-negative integer that does not exceed 10^9.

Output

Print a single number, the number of the World Evil tentacles Pinky and Brain will command.

Sample Input

```
3 4
4 4 4
1 1 5
5 5 3
4 1 2
1 3 1
3 5 4
1 4 3

2 2
9 2
2 3
6 1
```

Sample Output

```
7
11
```

G. Tour

Bajtocka year's Olympiad in Informatics was extremely unfavorable for Byteman. Since he was not qualified even to the last stage the Olympics, can not participate in the Camp Training Centre of the Science. Bajtoniego Bitrara (ONTBB).

The time that has passed since the memorable event for the holiday, heal wounds Byteman, but he had not planned any vacation alternative. Fortunately, he Byteman matters into their own hands and decided to go on a cycling tour across Byteotia. A young science student found $n + 1$ more cities which have to route their trips, as well as carefully chosen route, which will be traveled to other cities. Each road has its length in kilometers and the experience factor, which can be both positive and negative. The last thing you need to plan the entire route is the division into sections corresponding to the successive days of his trip. Each episode is to begin and end in a certain town, and its length may not exceed D km. Moreover, the *experience factor* for the section is defined as the sum of the squared successive impressions on this stretch of road. More formally, if a segment consists of roads with coefficients in turn experience $w_1, w_2, \ldots, w_m$, the ratio of impressions of this episode is the number of $(w_1 + w_2 + \ldots + w_m)^2$.

Since Byteman a man whose great experience too scared, he would divide the route into sections, so that none of them was longer than D km, and the sum of the coefficients experience subsequent sections as small as possible. Help him in this task.

Input

There are multiple test cases in the input file terminated by EOF. For each test case:

The first line of standard input contains two integers n and D, $(1 \leq n \leq 100000, 1 \leq D \leq 10^{12})$ Denoting respectively the number of roads in the route Byteman and maximum length of the segment. In the following n lines are descriptions of the following ways i-th of these lines contains two integers d_i and w_i, $(1 \leq d_i \leq D, -10000 \leq w_i \leq 10000)$ denotes the length in kilometers respectively and the coefficient of experience i-th road.

Output

The only line of standard output should appear an integer equal to the minimum possible sum of the coefficients experience further episodes of the tour Byteman.

Sample Input

```
5 15
7 4
8 -5
4 2
1 -1
2 4

5 15
7 4
8 -5
4 2
1 -1
2 4
```

Sample Output

```
14
14
```

H. Equivalence palindromic

Two strings $s = s_1 s_2 \dots s_n$ and $t = t_1 t_2 \dots t_n$ both with length n are called *palindromically equivalent* if for every pair (i, j), $1 \leq i \leq j \leq n$, the substring $s_i s_{i+1} \dots s_j$ of s is a palindrome if and only if the substring $t_i t_{i+1} \dots t_j$ of t is a palindrome.

For a given string s, please find the number of palindromically equivalent strings which containing only lowercase letters. Output this number modulo $10^9 + 7$.

Input

There are multiple test cases in the input file terminated by EOF. For each test case:

The first line of standard input is not empty words consisting of lower case letters, not exceeding 10^6.

Output

Output each test case in a line.

Sample Input	Sample Output
`abba`	`650`
`aba`	`650`