Problem A. Titan Ruins: Hidden Entrance

Time limit: 1 second
Memory limit: 64 megabytes

Soren and Alba were famous and powerful wizards. They had been the founders of a magic guild that had united wizards of the Northern Territories and given them freedom and independence from the Southern Empire. Despite their venerable age, the friends still took an active part in all important events. When explorers of the Aspen Gorges found the remains of structures built by ancient Titans, who had created the world, Soren and Alba were among the first wizards to arrive to the place. They knew that Titans had been the most powerful wizards ever, and almost any study of their traces would give a strong impulse to the development of modern magic and would allow to understand the nature of magic on the whole.

When Soren and Alba approached the Titan Ruins, they saw a blank wall standing out only a little bit against a rock. The wall was divided into small identical sections.

'Where's the entrance?' Soren asked.

'It's hidden, I suppose,' Alba said. 'Did you think that Titans would open the gate for you? They were always very serious about their safety. But I'm sure there's a real door somewhere among these sections. As far as I remember, all Titans' structures that we know have a door, and its width is exactly three such sections.'

'That's good, but how can we find it? The wall is long, and the spell for dispersing such illusions requires much magic power. We can't apply the spell to the whole wall.'

'Yes, the Masking Spell affects the whole wall, but its force is nonuniform. I'm almost sure the spell is strongest exactly where the door is hidden. I have just activated the Magic Field Scanning Spell, and very soon we'll know the force of the field acting on each section. We'll only have to choose three consecutive sections with maximum total force of the field and apply the Dispersal Spell to these sections.'

Input

The first line contains the number n of sections in the wall ($3 \leqslant n \leqslant 1000$). In the second line you are given n positive integers a_i, which are the forces of the magic field acting on each section ($1 \leqslant a_i \leqslant 10^6$).

Output

Output two integers separated with a space. They should be the maximum total force of the field acting on three consecutive sections of the wall and the number of the middle section in this segment. It is guaranteed that there is only one answer.

Example

6 1 4 4 4 1 1	12 3

Problem B. Titan Ruins: Escaping Fire

Time limit:	1 second
Memory limit:	64 megabytes

Soren walked around the room looking for hidden exits but didn't find any.
'Seems like we have to go down this tunnel.'
'It can be a long way...' Alba sighed.
'I have an idea! Look at this cart, we can roll down in it, that'll be much faster.'

So they did. Luckily, the floor in the tunnel was smooth and even, and, though the tunnel's walls were quite close to the cart, there was still enough space to go without any difficulties.

A few minutes later a strange noise captured Soren's attention. He turned around and saw a huge wall of fire following them and getting closer and closer. Apparently, they somehow activated a trap.
'Listen, we have to do something about this thing or it will burn us...'
'Well, I can put up a magic shield that will keep the fire behind the cart. But it'll take a lot of energy and I can't see where this tunnel ends.'
'Are you a wizard or what? Use the Space Scanning Spell!'
'Right you are... Ok, there are some side tunnels down the tunnel. We can turn to one of them, so that the fire will pass us by. But the floor in the side tunnels is not as smooth as here, and the cart will slow down.'
'That's good, if you think of it. We don't want to return to the tunnel until the whole fire wall has gone ahead of us. Maybe we'll even have to cast the Deceleration Spell inside the side tunnel. Even if the cart stops completely and we have to go by foot it will still be better than death.'

Meanwhile, the wall of fire continued to approach the cart. Time was running out, and a plan had to be developed fast. Wizards can turn to a side tunnel only once because the cart is very old and not suited well for making turns. But which tunnel to use?

The friction in the tunnel is such that the cart moves at a constant speed. In all the side tunnels, however, the cart moves with the same constant deceleration. In addition, Alba and Soren can use the Deceleration Spell to increase the roughness of the floor in any particular side tunnel (and thus increase the deceleration in that side tunnel). The spell can be cast at different power levels, increasing the deceleration proportionally to the amount of magic energy spent. The cart decelerates only when it is fully inside of a side tunnel. The Shield Spell can be cast when the fire is right behind the cart and makes the fire stay there, but this spell requires a constant supply of magic energy. There is no need to use the Shield Spell while the cart is fully inside of a side tunnel.

Input

The first line contains eight integers: v is the speed of the cart, l is its length, V is the speed of the fire wall if it is not kept back by a magic shield, L is the depth of the fire wall, D is the current distance from the fire wall to the cart's back end, a is the cart's deceleration due to the roughness of the side tunnel floor, k is the amount of magic energy needed to sustain a magic shield behind the cart for one second, and c is the amount of magic energy consumed by the Deceleration Spell to increase deceleration by $1\frac{m}{s^2}$, $(0 < v, V, a, l, L, D < 10^5;\ v < V;\ 0 \leqslant k, c \leqslant 10^4)$.

The second line contains the number of side tunnels n $(1 \leqslant n \leqslant 1\,000)$. In each of the next n lines there are two integers l_i and r_i; they are the distances from the front of the cart to the beginning and to the end of the corresponding side tunnel $(0 < l_i;\ l_i + l < r_i < l_{i+1};\ r_i < 10^5)$.

All the distances are given in meters (m), the speeds are given in meters per second $(\frac{m}{s})$, and the units for the deceleration are meters per second squared $(\frac{m}{s^2})$. The cost of the Shield Spell is given in magic energy units per second, and the cost of the Deceleration Spell is given in magic energy units per deceleration units.

Output

Output the least possible amount of magic energy that the wizards will have to spend to escape the fire wall. The answer must be given with absolute or relative error not exceeding 10^{-5}.

Example

1 1 2 1 1 100 1 1234 1 100 102	100.000

Problem C. Titan Ruins: Passing through Walls

Time limit: 1 second
Memory limit: 64 megabytes

Soren opened his eyes with an effort but this didn't help much — there was a deaf darkness around. An unbearable pain in the back of his head prompted that he had hit his head in the fall. Spreading his arms he realized that he was in a very small room without any openings. Luckily, the wand was intact, which meant that Soren could still use magic.

Casting the Scanning Spell, he discovered disappointingly that identical small square rooms with solid walls were spreading evenly in all directions. There was only one thing to be glad about — Alba, still alive, was in the adjoining room. Soren contacted him telepathically.
'Are you alright?'
'Almost.'
'Have you got any ideas on how to get out of here?'
'There's no way out through the top, but we can try passing through the walls. Some of them are thinner than others. If we combine our powers, we can take one of us through a thin wall. It's a pity the rooms are so small — we can't get into the same room together. And we always have to stay in rooms that have at least one common corner so that we can keep contact. It'll be hard, but let's try.'

Soren draw a scheme of all the rooms and marked thin and thick walls. It turned out that all the rooms together formed a large rectangle, around which there were no walls, so that it was possible to move freely anywhere outside the rectangle. Now Alba and Soren had to understand how they should move between the rooms to get both of them out of the trap.

Input

The first line contains the dimensions of the rectangle n and m ($1 \leqslant n, m \leqslant 250$). In the following $2 \cdot n + 1$ lines you are given a scheme of the trap. There are $2 \cdot m + 1$ symbols in each line. Soren and Alba are denoted by the symbols «1» and «2»; their rooms have at least one common corner. The symbols «|» and «-» denote thick walls. The symbols «.», «+», and « » denote thin walls, corners, and empty rooms, respectively.

Output

If Soren and Alba can't get out of the trap, output the line «Death». Otherwise, output the minimum number of passages through thin walls that Soren and Alba must make to free themselves.

Example

3 4 +.+-+-+-+ | . .1. | +-+-+-+.+ | .2. . | +.+.+.+-+ | . | | | +.+.+-+-+	13
1 2 +-+-+ .1|2. +-+-+	Death

Problem D. Titan Ruins: Old Generators Are Fine Too

Time limit: 1 second
Memory limit: 64 megabytes

'It seems that we're trapped,' said Soren when the door had suddenly shut behind him.
'It seems that I've heard this today at least five times. Don't panic, and let's think how we can get out,' Alba replied. 'If there's a door, there's a way to open it. We only have to find this way. Can you see that crystal? I think it's somehow related to the door. Let's try and use it.'

However, all their efforts to use the crystal were in vain. All they'd managed to do was to open the door by a fraction of a millimeter.

'It seems that I've guessed it right,' Alba concluded. 'But we don't have enough power to open the door.'
'Let's activate those two magic power generators. They're old and won't work at full capacity, but if they work together, maybe they'll produce enough power for the door to open.'

Each of the wizards can collect power from any generator and transfer it to the other wizard or to the crystal. Such transfers are only possible at distances not exceeding R. It remains to choose where to stand so as to transfer the power from both generators to the crystal.

Input

The first line contains the integer R ($1 \leqslant R \leqslant 10^4$). In the second line you are given the integer coordinates x and y of the crystal ($-10^4 \leqslant x, y \leqslant 10^4$). The third and fourth lines contain the integer coordinates x_i, y_i of the generators ($-10^4 \leqslant x_i, y_i \leqslant 10^4$). These three points are pairwise different.

Output

If Alba and Soren can't stand so as to transfer the power of both generators to the crystal, output «`Death`». Otherwise, output the phrase «`Now we have enough power`» in the first line. In the following two lines output the coordinates of the points where the wizards should stand. The coordinates should be given with absolute or relative error of at most 10^{-5}. If there are several possible variants, output any of them.

Examples

1 0 0 2 1 2 -1	Now we have enough power 1 0 2 0
1000 0 0 2 1 2 -1	Now we have enough power 2 -1 0 0
1 0 0 5 0 0 5	Death

Problem E. Titan Ruins: Serial Control

Time limit: 1 second
Memory limit: 64 megabytes

'It seems that we're in a trap,' said Alba.
'That was my phrase,' Soren replied.

Alba and Soren were in a strange room, which, apparently, had been used for experimenting on serial remote control. There was a row of n magic rings along each of two opposite walls. All the rings in one of the rows were accessible, while the rings in the other row were protected by an impenetrable magic field, and it was impossible to approach them.

Alba rotated one of the accessible rings a little, and all the rings in the protected row rotated in different ways. He rotated another ring, and the protected rings rotated in another way. He continued the experiments and found out that a rotation of any ring in the open row produced a rotation of each ring in the protected row by a certain angle, which was proportional to the angle by which the open ring was rotated. The directions of rotations could be both clockwise and counterclockwise.

While Alba was studying the rings, Soren tried to figure out how they could get out of the room. There were two doors, and, apparently, each door was controlled by an energy flow passing through a row of rings. One of the flows passed through the open row, while the other passed through the protected row.

An energy flow could pass through a row and open a door only if each ring in this row was in a certain position. If a ring was rotated from this 'correct' position by an integer number of complete turns, the energy flow could still pass freely, but if a ring was rotated by a fraction of a complete turn, the flow was blocked. Soren understood that the flows of magic energy had once kept the doors open, but later the energy generator had become weaker, and there wasn't enough energy to keep both doors open. It was necessary to block one of the flows so that the remaining flow could use all the energy produced by the generator. Then the flow would open one of the doors.

Alba and Soren needed to go through the door leading further down the dungeon. That door was controlled by the flow passing through the protected row.

Input

The first line contains the number n of rings in each row ($1 \leqslant n \leqslant 100$). In each of the following n lines you are given n integers separated with a space. A counterclockwise rotation of the i-th accessible ring produces A_{ij} counterclockwise rotations of the j-th protected ring, where A_{ij} is the i-th integer in the j-th line. The absolute values of A_{ij} do not exceed 100. The initial positions of all the rings allow a flow of magic energy pass freely through them.

Output

If the wizards can't get further, output «`Death`». Otherwise, output «`Power of magic saves lives`».

Example

3 1 2 0 4 3 0 0 0 0	Power of magic saves lives

Mages can rotate the first accessible ring 6/5 turns clockwise, the second ring 8/5 turns counterclockwise, and keep the third one still. As a result the first protected ring will make 2 full turns counterclockwise, while the second and the third rings will end up in their initial positions.

Problem F. Titan Ruins: Repeating Success and Failure

Time limit: 1 second
Memory limit: 64 megabytes

'It seems that we're in a trap,' said Soren.
'A very familiar phrase,' Alba replied.

The friends were locked in a room, which, apparently, had been a sort of laboratory where object copying experiments had been conducted. They decided so because there were large piles of coins in the room and the coins in each pile were identical to each other up to tiny scratches.

Soren studied the room and found a row of holes in one of the walls. The size of each hole was equal to the size of a coin, and he conjectured that the door would open when certain coins were put in the holes. At the same time, Alba examined the book on the table and discovered in it a description of an experiment with coins. In this experiment, coins were put one upon another forming a stack. Sometimes the top coin was removed, and sometimes the Copying Spell was applied, which produced an identical stack located on top of the existing stack.

Soren and Alba decided to repeat the experiment, putting the coins removed from the top of the stack into the holes one by one. They supposed that the door would open after that. However, they didn't know the Copying Spell, so they had to find out which coins were at top of stack without actual reproducing of all experiment. There were lots of various coins in the room they could use, but still it wasn't easy to choose which coins had to be put in the holes.

Input

The first line contains the number n of operations in the experiment ($1 \leqslant n \leqslant 10^6$). In each of the following n lines you are given an integer x ($-1 \leqslant x \leqslant 10^9$). If $x > 0$, then a coin of type x is put on top of the stack. If $x = -1$, then the top coin is taken from the stack and put into the next hole in the wall. If $x = 0$, then the stack is copied. It is guaranteed that during the experiment each time a coin was to be removed the stack was not empty.

Output

Output the types of coins removed from the top of the stack in the course of the experiment. The numbers should be given one per line.

Example

8 3 4 0 -1 -1 -1 -1 1	4 3 4 3

Problem G. Titan Ruins: Stability is a Sign of Stagnation

Time limit: 1 second
Memory limit: 64 megabytes

'Things are going from bad to worse,' Soren said when he and Alba entered a room with painfully familiar coins. This time something was a bit different. All the coins were arranged into neat stacks, and strange soft claps were heard from time to time. Soren felt that the coins contained magic power and some of them were unstable. A slight impulse was enough to make such a coin transform into several new coins. Some of the new coins had no magic power and were absolutely stable, while others were unstable and could transform in the same manner.

Having studied the book lying on the table, Alba learned that there were only several types of unstable coins and that coins of the same type always transformed in the same way. When an unstable coin transformed all the coins above it were pushed up and placed on top of the new coins.

One of the walls had a vertical cavity exactly one coin wide. Soren conjectured that the door would open if the cavity was filled with a stack of coins. But which coins? Alba and Soren understood that they couldn't put unstable coins into the cavity, because their transformations might cause unpredictable effects. They decided to wait until one of the unstable coins turned into a stack of stable coins, take several consecutive coins from this stack, and put them into the cavity. But first they wanted to know the number of different ways to fill the cavity in this way.

Input

The first line contains the number n of coin types and the number k of coins in a stack that can fill the cavity ($2 \leqslant n, k \leqslant 100$). The i-th of the following lines describes the i-th type of coins. If the type is stable, the line contains the number -1. Otherwise, the line starts with the number k_i of coins into which a coin of type i transforms. After this number, there are k_i integers x_{ij}, which describe the appearing stack ($1 \leqslant k_i \leqslant 100$; $1 \leqslant x_{ij} \leqslant n$). The integers x_{ij} are the types of coins in this stack from bottom to top. The sum of all k_i does not exceed 100. It is guaranteed that any unstable coin will eventually transform into a stack of stable coins.

Output

Output the remainder in division of the number of different suitable parts of stacks by $10^9 + 7$.

Example

7 3 3 3 2 2 3 4 5 5 1 7 -1 -1 3 7 7 7 -1	5

A coin of type 3 produces one coin of type 7. A coin of type 2 produces a stack 4-5-5. From a coin of type 1, in the end we obtain a stack 7-4-5-5-4-5-5, and a coin of type 6 produces a stack 7-7-7. Therefore, all possible parts of stacks of height 3 are 7-7-7, 4-5-5, 7-4-5, 5-5-4, and 5-4-5.

Problem H. Titan Ruins: Better Late Than Killed

Time limit: 1 second
Memory limit: 64 megabytes

'It worked! The door is open!' Soren said with relief. 'We only have to do something with this huge pile of coins. It blocks the way.'
'Let's not waste time and blow them up. All these coins are really starting to annoy me,' Alba replied.
'Well, it's quite dangerous. Don't forget that the coins are magic, so when you cast a spell to destroy them, each coin strikes back with a shockwave of the same power as the spell. If we destroy k coins, the response will be k times stronger than our spell. We can kill ourselves just by casting a spell that is too powerful. The only good thing is that the shockwave energy has a bit different nature and will not cause new explosions.'
'Seems like we'll have to choose the power of each spell very carefully.'
'It's not that difficult. Each coin has its resistance limit. The Annihilation Spell destroys all the coins whose resistance limit is no greater than the power of the spell. We'll just have to cast the spell several times, each time increasing the power, that's all.'
'And how many times do we have to hide from the shockwaves?'
'It doesn't really matter. We only need to remove as many coins as we can without killing ourselves.'
'Yeah, but we better try to cast as few spells as possible.'
'Sure.'

Input

The first line contains two integers: n is the number of coins and p is the maximum shockwave power the wizards can survive ($1 \leqslant n \leqslant 1000$; $1 \leqslant p \leqslant 10^9$). The second line contains n integers a_i, which are the resistance limits of the coins ($1 \leqslant a_i \leqslant 10^6$).

Output

Output two integers separated with a space: the maximum amount of coins the wizards can destroy without killing themselves and the minimum number of spells they have to cast the Annihilation Spell to destroy all these coins.

Example

5 4 4 1 4 1 2	3 2

Problem I. Titan Ruins: Inaction Leads to Decay

Time limit: 1 second
Memory limit: 64 megabytes

'Listen, I think that the creators of this place were just mad about experimenting with coins,' said Soren entering another room. In this room, he saw a large platform with a lot of control sticks and a small coin lying on the platform. Just for fun, Alba sent a weak charge of magic energy to the platform. Suddenly, instead of one coin, several coins appeared at the same place, but soon they started to disappear one after another until only one coin remained. Alba sent one more charge, and several coins appeared again. Another charge, and the number of coins decreased.

Continuing the experiments, Soren and Alba discovered the following rules.

- The number of coins on the platform after sending a magic charge depends only on the number of coins that were on the platform before the charge was sent and is independent of the charge size and other factors.
- A charge may increase or decrease the number of coins, or the number of coins may stay the same. At any time there is at least one and at most n coins.
- If no charge is sent for some time, the coins disappear one by one until one coins remains on the platform. This happens slowly, so that a new charge can be sent at any time — when there is any intermediate number of coins on the platform.
- The platform has n control sticks, and each control stick can be in one of n positions. If, at some moment, there are i coins on the platform and the ith stick is in position j, $1 \leqslant j \leqslant n$, then the number of coins on the platform after a charge has been sent becomes j.

Having examined the platform thoroughly, Soren found a small hidden door. It was locked, and he conjectured that the door could be opened if the control sticks were in certain positions. Since there were too many combinations of positions, the friends decided to try only those combinations for which the maximum number of n coins could be obtained from one coin. There had to be a smaller number of such combinations, but how many?

Input

You are given the integer n ($2 \leqslant n \leqslant 5000$).

Output

Output the remainder in division by $10^9 + 7$ of the number of positions of the control sticks that Soren and Alba should check.

Example

2	2

Problem J. Titan Ruins: Making Headway

Time limit: 1 second
Memory limit: 64 megabytes

Soren scratched his head thoughtfully. The way forward was blocked by a very powerful magic field. It seemed impossible to get around it, because the corridor hadn't branched for the last three hours. Soren and Alba didn't have enough power to break the field. So they had to find a way to turn it off somehow. There was a small rectangular hole in one of the walls, and it seemed that the flow of magic energy that supported the field was streaming from that hole. It seemed to be a good idea to cover the hole with something.

Alba investigated the objects in the corridor. There was a small hollow cylinder lying beside one of the skeletons. The cylinder induced some strange changes in the magic fields around it. After some experiments, Alba understood that the lateral surface of the cylinder blocked magic energy completely. 'This is exactly what we need,' he thought. They could cut out a piece of the surface, straighten it, and cover the hole with it. Looking around, Alba found other hollow cylinders made of the same material. It remained to understand which of the cylinders were large enough to cut out a piece of required size.

Input

The first line contains integers w and h, which are the sizes of the hole in the wall ($1 \leqslant w, h \leqslant 10^6$). In the second line your are given the number n of cylinders ($1 \leqslant n \leqslant 1000$). i-th of the following n lines contains two integers H_i and L_i — height and circumference of the i-th cylinder ($1 \leqslant H_i, L_i \leqslant 10^6$).

Output

Output a line for each of the cylinders: «`Block the hole`» if a required piece can be cut out from it and «`Too small`» otherwise.

Example

314 314 4 314 314 314 313 600 500 234 3456	Block the hole Too small Block the hole Too small

Problem K. Titan Ruins: the Infinite Power of Magic

Time limit: 1 second
Memory limit: 64 megabytes

'It seems that our efforts were not in vain,' Alba said after studying an ancient volume. 'I've found here a method for accumulating a tremendous amount of energy. And the idea is so simple that I wonder why nobody has discovered it. The usual problem is that magic energy is unstable and it's difficult to keep it in one place. But if we channel it along a closed path, it'll have no way out. We only have to choose the right length of the path to keep the flow stable. Then we can pump in as much energy as we want. And when we break the path we'll release a magic flow of enormous power. It'll be a real breakthrough in war magic!'
'Yes, but the path must be long enough and you can't drag a large device over a battlefield.'
'That's not a problem. The form of the path can be arbitrary. We can design a compact scheme of the device. Actually, the device is here already, it's there in the corner. We only have to adjust it.'
Indeed, there was a square grid with $n \times n$ nodes. At each node there was a prism that could be turned so as to either direct a flow of magic energy straightly or turn it by 90°. Soren and Alba had to position L prisms so that a cyclic flow of magic energy of length L could be directed through them.

Input

You are given the integers n and L ($2 \leqslant n \leqslant 100$, $4 \leqslant L \leqslant 20\,000$).

Output

If it is impossible to organize a cycle of required length, output «`Unsuitable device`». Otherwise, output «`Overwhelming power of magic`» in the first line. In each of the following L lines give two integers in the range from 1 to n, which are the coordinates of the grid nodes through which energy should pass. The distances between two consecutive nodes and between the first and the last nodes must be equal to 1. The energy mustn't pass more than once through the same node, because this may produce unpredictable and, most likely, lethal effects.

Example

2 6	Unsuitable device
3 6	Overwhelming power of magic 1 1 2 1 3 1 3 2 2 2 1 2