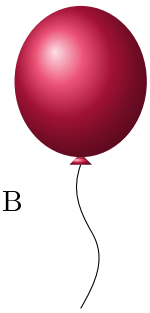
A1 Project Allocation (Subtask)



Time limit: 1.0s
Memory limit: 1024MB

Marta has two employees named Arda and Bimala. For each of the next n days, she will receive a project and must choose which employee to assign it to. Arda and Bimala will complete the ith project with quality a_i and b_i respectively. However, if *at any point* either employee is assigned more than k projects more than their colleague, they will complain that the allocation is unfair.

Help Marta decide the maximum total quality that her team can achieve without complaints.

Input

The first line of input consists of two space-separated integers n ($1 \leq n \leq 1000$) and k ($k = 1$), representing the number of projects and the largest tolerable difference in the number of projects assigned to each employee.

n lines follow, the ith of which consists of two space-separated integers a_i and b_i ($1 \leq a_i, b_i \leq 10^6$), representing the quality of Arda's and Bimala's work respectively for task i.

Output

Output a single integer, the maximum total quality that can be achieved without any complaints.

Samples

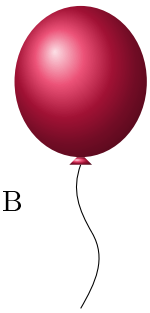
Sample input 1	Sample output 1
2 1 2 1 3 1	4

Explanation of sample 1.
Arda would produce better quality for either project, but he will complain if he is assigned the first two projects at which point Bimala has none. Therefore Bimala should be assigned project 1 and Arda project 2, for a total quality of 4.

Sample input 2	Sample output 2
5 1 2 6 7 1 1 4 1 10 3 5	29

Explanation of sample 2.
Arda can be given projects 2 and 3, and Bimala projects 1, 4 and 5, for a total quality of $6 + 7 + 1 + 10 + 5 = 29$. At no point does either employee have more than one project more than their colleague.

A2 Project Allocation (Full)



Time limit: 1.0s
Memory limit: 1024MB

Marta has two employees named Arda and Bimala. For each of the next n days, she will receive a project and must choose which employee to assign it to. Arda and Bimala will complete the ith project with quality a_i and b_i respectively. However, if *at any point* either employee is assigned more than k projects more than their colleague, they will complain that the allocation is unfair.

Help Marta decide the maximum total quality that her team can achieve without complaints.

Input

The first line of input consists of two space-separated integers n ($1 \leq n \leq 1000$) and k ($1 \leq k \leq n$), representing the number of projects and the largest tolerable difference in the number of projects assigned to each employee.

n lines follow, the ith of which consists of two space-separated integers a_i and b_i ($1 \leq a_i, b_i \leq 10^6$), representing the quality of Arda's and Bimala's work respectively for task i.

Output

Output a single integer, the maximum total quality that can be achieved without any complaints.

Samples

Sample input 1	Sample output 1
2 1 2 1 3 1	4

Explanation of sample 1.
Arda would produce better quality for either project, but he will complain if he is assigned the first two projects at which point Bimala has none. Therefore Bimala should be assigned project 1 and Arda project 2, for a total quality of 4.

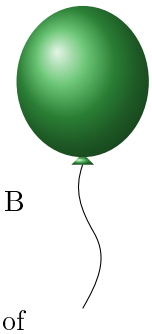
Sample input 2	Sample output 2
5 1 2 6 7 1 1 4 1 10 3 5	29

Explanation of sample 2.
Arda can be given projects 2 and 3, and Bimala projects 1, 4 and 5, for a total quality of $6 + 7 + 1 + 10 + 5 = 29$. At no point does either employee have more than one project more than their colleague.

Sample input 3	Sample output 3
5 2 2 6 7 1 1 4 1 10 3 5	30

Explanation of sample 3.
Arda can be given projects 2 and 5, and Bimala projects 1, 3 and 4, for a total quality of $6 + 7 + 4 + 10 + 3 = 30$. Note that while the overall allocation gives Bimala only one more project than Arda, she would still complain if k was 1 rather than 2, since after the first four projects she has three while Arda only has one.

B1 Tower Power (Subtask)



Time limit: 1.0s
Memory limit: 1024MB

King Ansew rules over the land of Cardinalia. The kingdom is divided into a rectangular grid of land plots, with m rows (East-West) and n columns (North-South).

King Ansew has decided to erect k towers to defend Cardinalia. Each tower takes up an entire land plot, and will have four cannons pointing North, South, East and West. Each cannon can fire any distance in its given direction up to the next tower in that direction or the border of Cardinalia; King Ansew does not want his own towers destroyed, nor to start wars with the neighbouring kingdoms.

The *power* of a tower is the total number of land plots that all four of its cannons can safely fire into.

As the towers are built *one by one*, advise King Ansew of the power of each tower *at the time it is built*.

Input

The first line of input consists of three space-separated integers, m, n ($1 \leq m, n \leq 1,000$) and k ($1 \leq k \leq 1,000$), representing the number of rows, columns and towers respectively.

k lines follow, the ith of which consists of two space-separated integers, r_i ($1 \leq r_i \leq m$) and c_i ($1 \leq c_i \leq n$), representing the row and column of the ith tower. No two towers have the same position.

Output

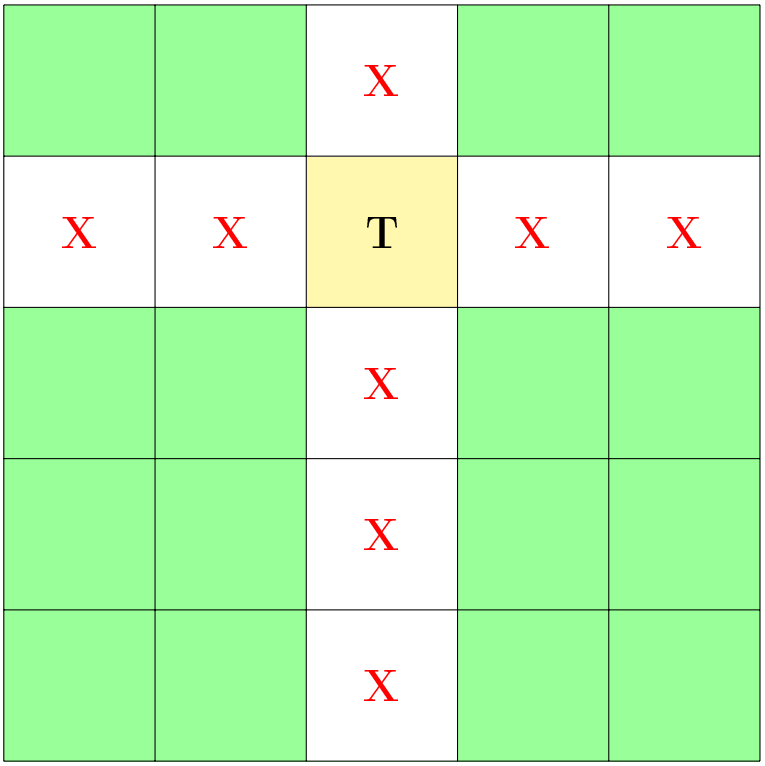
For each tower, output a single integer, the number of plots that the new tower can fire into.

Samples

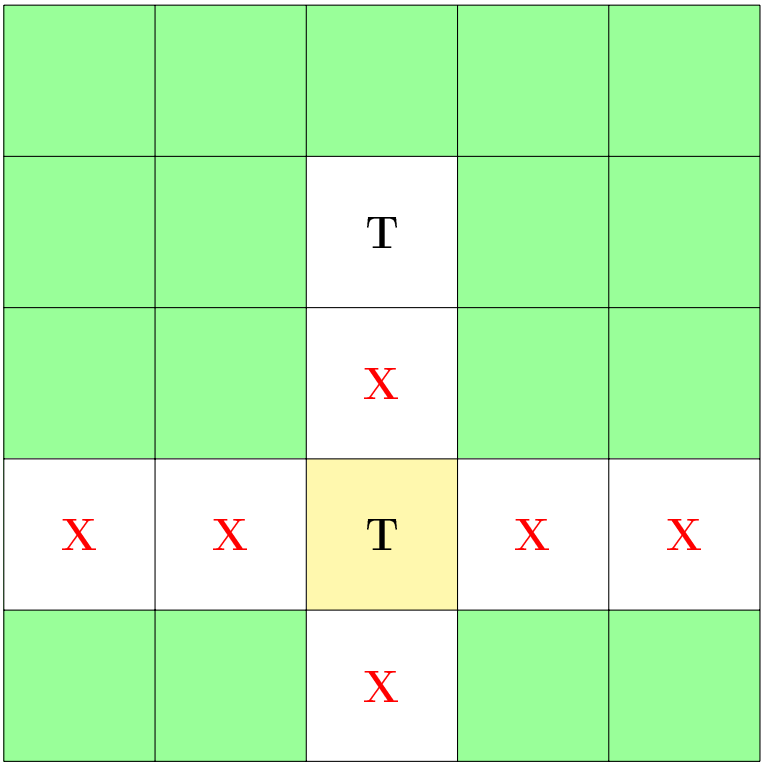
Sample input 1	Sample output 1
5 5 5 2 3 4 3 2 5 5 5 5 3	8 6 5 6 3

Explanation of sample 1.
There are five rows and five columns.

The first tower is in row 2 and column 3. It can fire West to two plots, East to two plots, North to one plot and South to three plots, each time constrained by the borders of Cardinalia. Therefore it has 8 power.

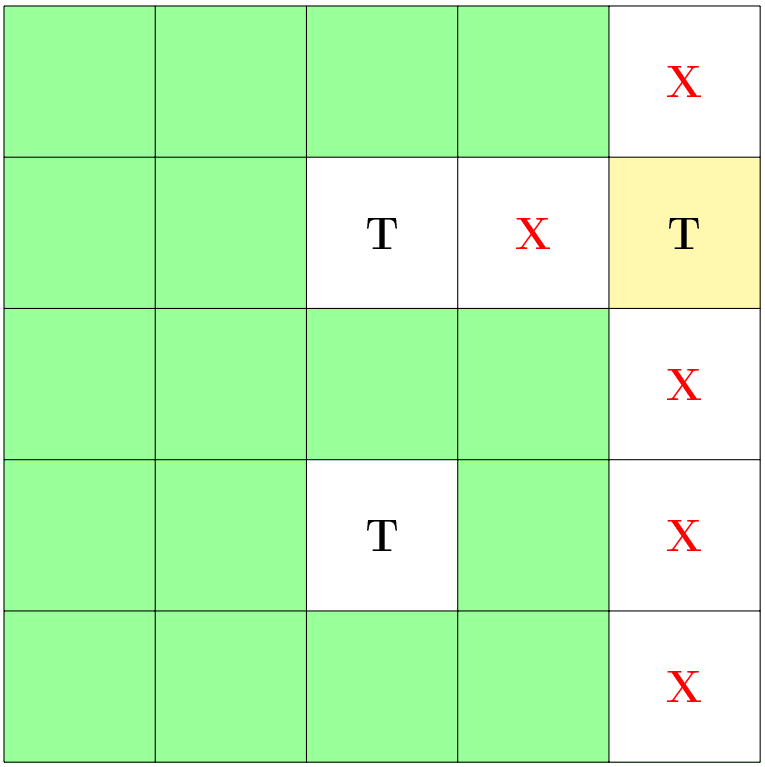


The second tower is in row 4 and column 3. It can again fire West, South and East to the borders of Cardinalia, but this time it can only fire one plot North; any further range is blocked by the previous tower. Its power is 6.

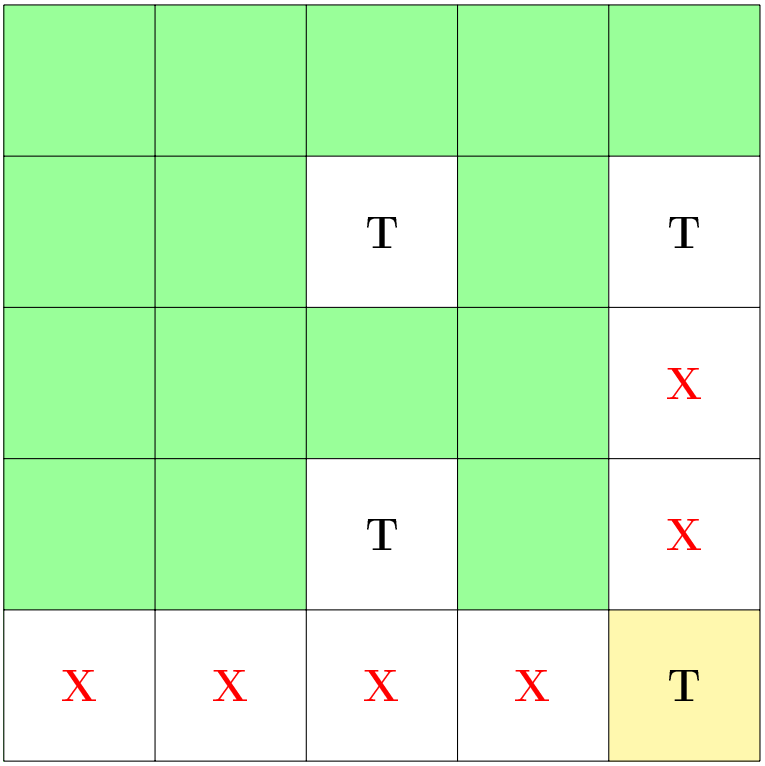


The third tower is in row 2 and column 5. It can fire West up to the first tower, and North and

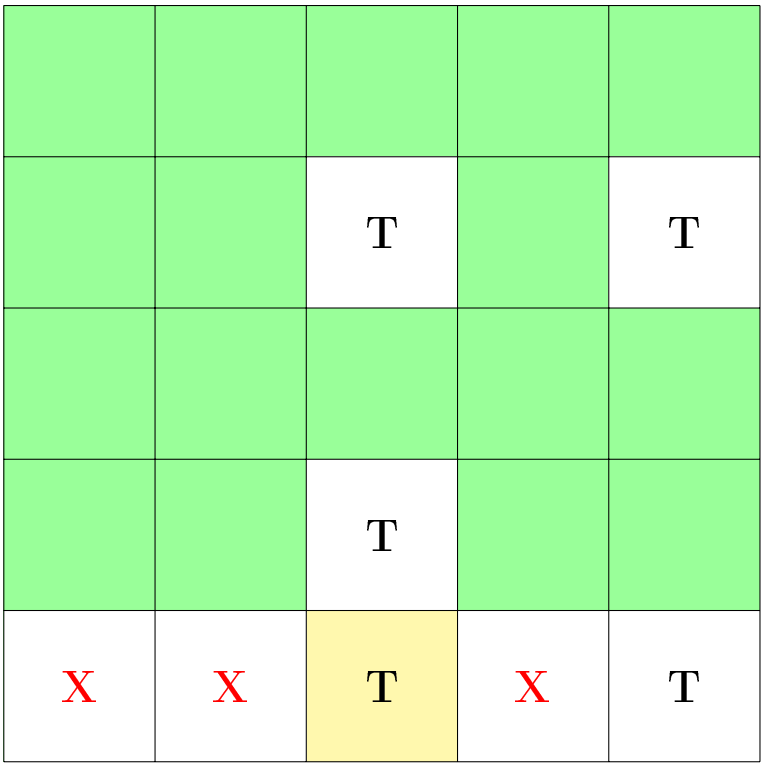
South unconstrained. It is already on the East border of Cardinalia, so it cannot fire any further East. Its power is 5.



The fourth tower is in row 5 and column 5. It cannot fire any further South or East as it is already in the southeast corner. It can fire North up to the previous tower and West for the entire width of Cardinalia. Its power is 5.



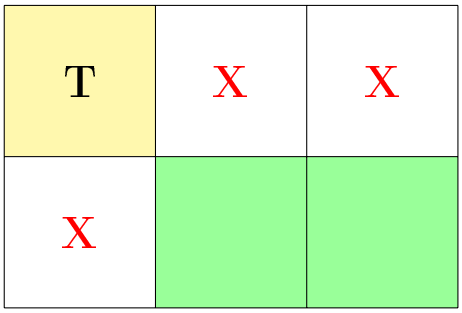
The fifth tower is in row 5 and column 3. It can fire East to the fourth tower, West to the border or North to the second tower. Its power is 3.



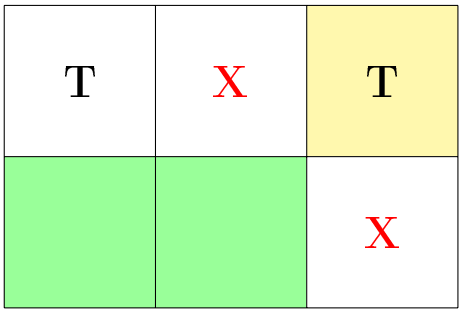
Sample input 2	Sample output 2
2 3 4 1 1 1 3 2 2 2 3	3 2 3 0

Explanation of sample 2.
There are two rows and three columns.

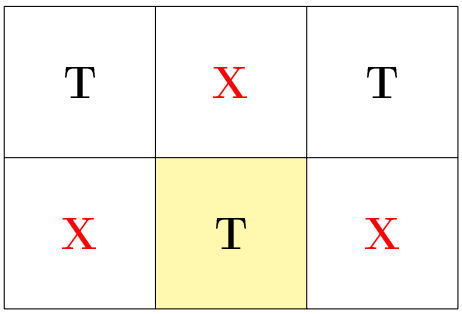
The first tower is in row 1 and column 1. It cannot fire North or West as it is already in the northwest corner. It can fire South one plot or East two plots, for a total power of 3.



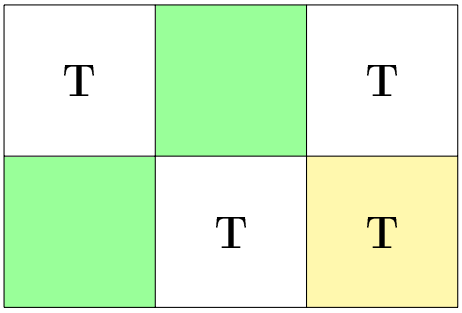
The second tower is in row 1 and column 3. It cannot fire North or East, and it can fire one plot South or West, so its power is 2.



The third tower is in row 2 and column 2. It cannot fire South, and it can fire one plot in any of the other three directions, so its power is 3.



The fourth tower is in row 2 and column 3. It is surrounded by other towers on two sides and the borders of Cardinalia on the other two sides, so its power is 0.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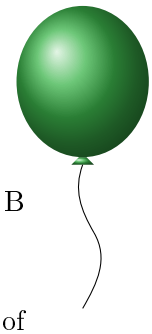
B2 Tower Power (Full)



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Memory limit: 1024MB

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King Ansew has decided to erect k towers to defend Cardinalia. Each tower takes up an entire land plot, and will have four cannons pointing North, South, East and West. Each cannon can fire any distance in its given direction up to the next tower in that direction or the border of Cardinalia; King Ansew does not want his own towers destroyed, nor to start wars with the neighbouring kingdoms.

The *power* of a tower is the total number of land plots that all four of its cannons can safely fire into.

As the towers are built *one by one*, advise King Ansew of the power of each tower *at the time it is built*.

Input

The first line of input consists of three space-separated integers, m, n ($1 \leq m, n \leq 1,000,000,000$) and k ($1 \leq k \leq 100,000$), representing the number of rows, columns and towers respectively.

k lines follow, the ith of which consists of two space-separated integers, r_i ($1 \leq r_i \leq m$) and c_i ($1 \leq c_i \leq n$), representing the row and column of the ith tower. No two towers have the same position.

Output

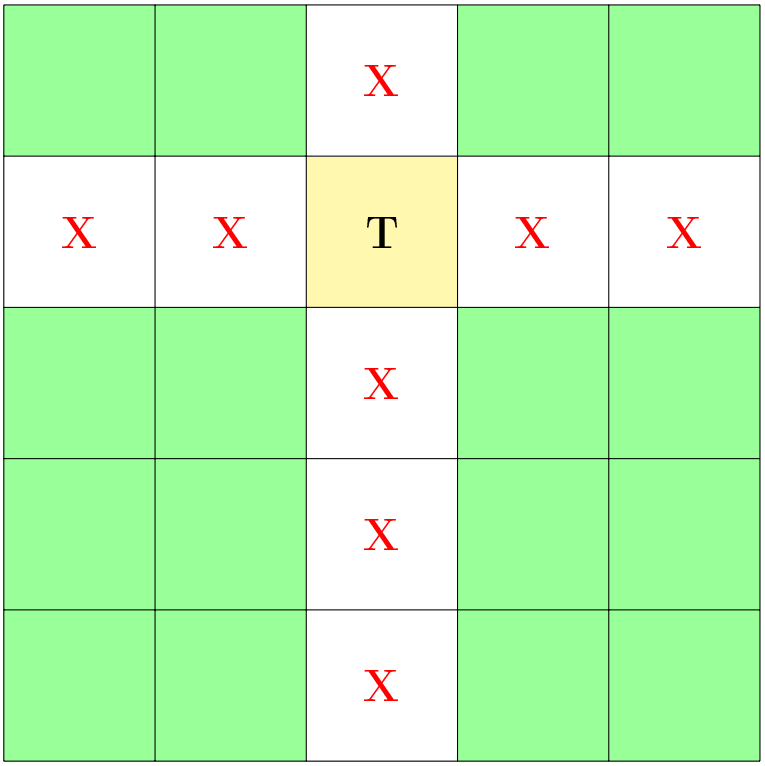
For each tower, output a single integer, the number of plots that the new tower can fire into.

Samples

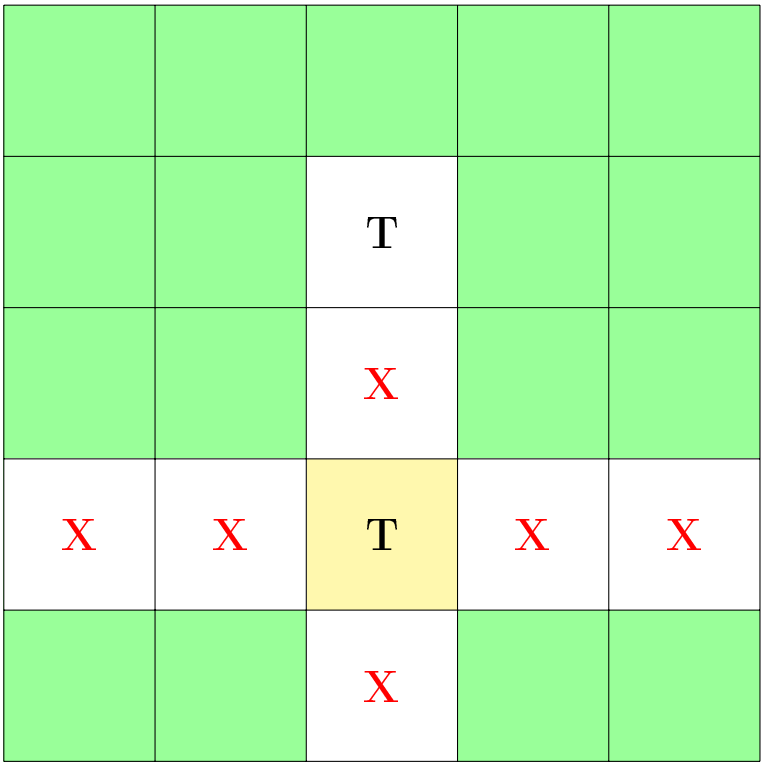
Sample input 1	Sample output 1
5 5 5 2 3 4 3 2 5 5 5 5 3	8 6 5 6 3

Explanation of sample 1.
There are five rows and five columns.

The first tower is in row 2 and column 3. It can fire West to two plots, East to two plots, North to one plot and South to three plots, each time constrained by the borders of Cardinalia. Therefore it has 8 power.



The second tower is in row 4 and column 3. It can again fire West, South and East to the borders of Cardinalia, but this time it can only fire one plot North; any further range is blocked by the previous tower. Its power is 6.



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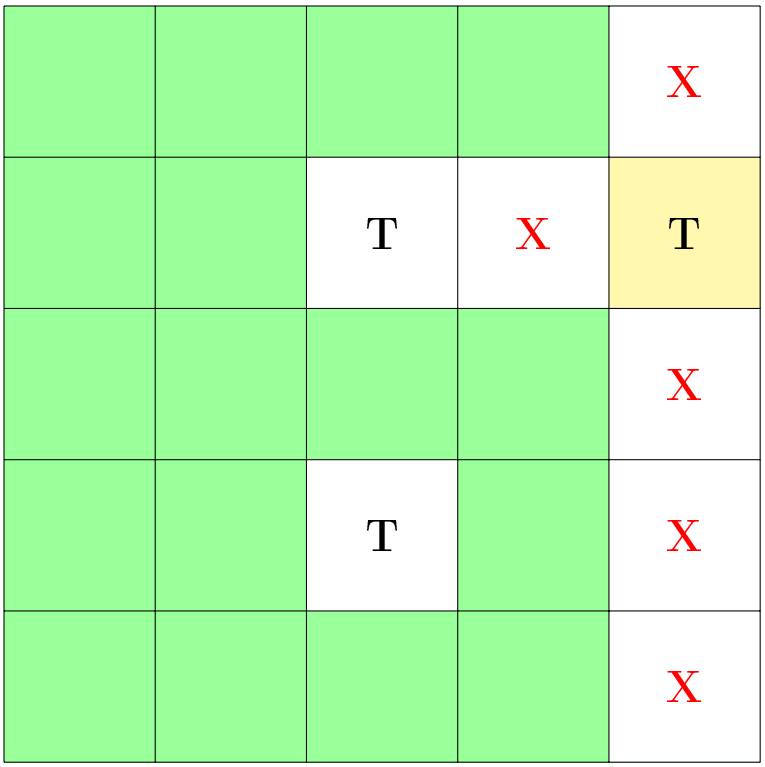

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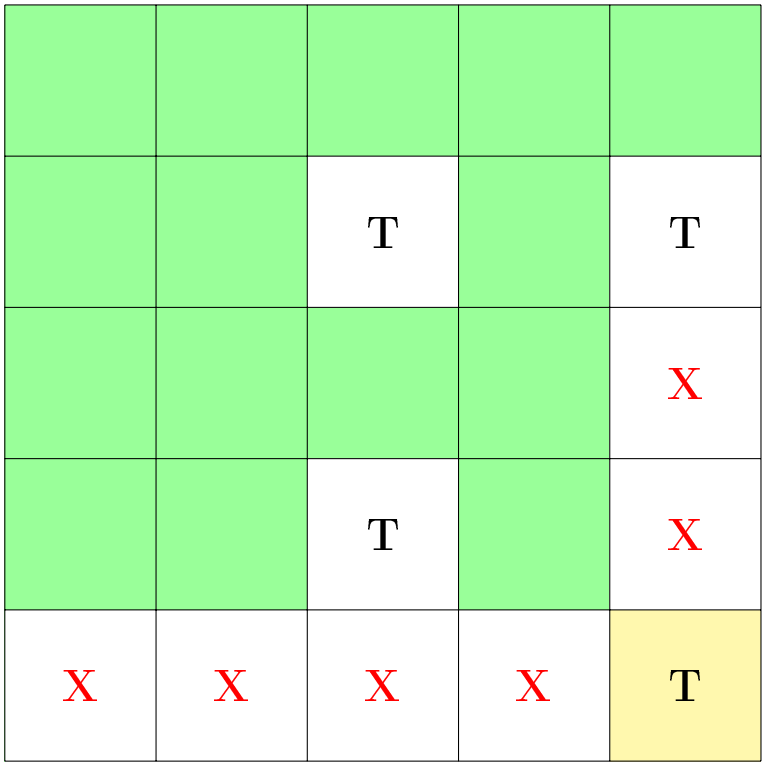
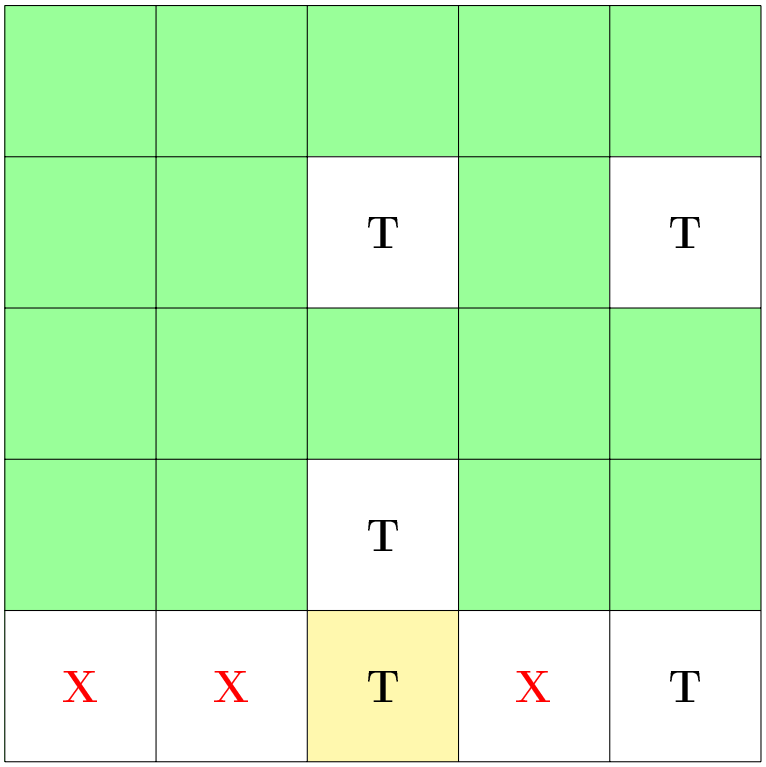


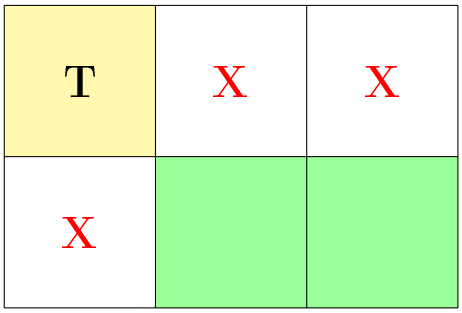
The fifth tower is in row 5 and column 3. It can fire East to the fourth tower, West to the border or North to the second tower. Its power is 3.



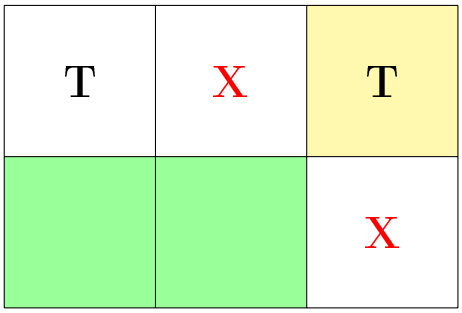
Sample input 2	Sample output 2
2 3 4 1 1 1 3 2 2 2 3	3 2 3 0

Explanation of sample 2.
There are two rows and three columns.

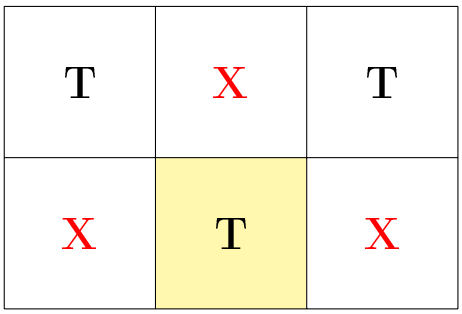
The first tower is in row 1 and column 1. It cannot fire North or West as it is already in the northwest corner. It can fire South one plot or East two plots, for a total power of 3.



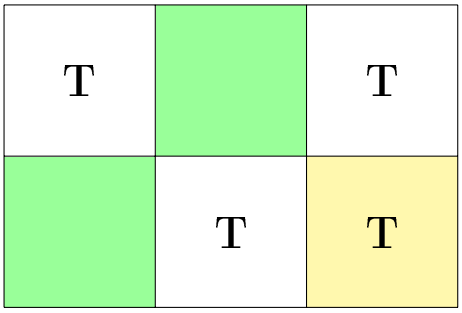
The second tower is in row 1 and column 3. It cannot fire North or East, and it can fire one plot South or West, so its power is 2.



The third tower is in row 2 and column 2. It cannot fire South, and it can fire one plot in any of the other three directions, so its power is 3.



The fourth tower is in row 2 and column 3. It is surrounded by other towers on two sides and the borders of Cardinalia on the other two sides, so its power is 0.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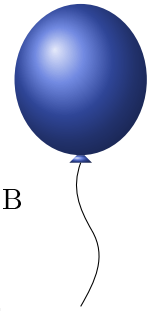
C1 One Millionth Visitor (Subtask)



Time limit: 1.0s
Memory limit: 1024MB

Nadja has a website where she posts motivational quotes. There are n visitors to her website, the ith of which makes their first visit on day a_i and returns every b_i days thereafter. If several people visit her website on the same day, they do so in the order of their visitor number (i.e. their order in the input).

Nadja wants to give a special prize to mark the kth visit to her website. Help her determine who should be given the prize.

Input

The first line of input consists of two space-separated integers n ($1 \leq n \leq 1,000,000$) and k ($1 \leq k \leq 1,000,000$), representing the number of visitors and the visit number to be awarded the prize.

n lines follow, the ith of which consists of two space-separated integers a_i and b_i ($1 \leq a_i, b_i \leq 1,000$), representing the day of visitor i's first visit and the number of days until each subsequent visit.

Output

Output a single integer, the number of the visitor who makes the kth visit.

Samples

Sample input 1	Sample output 1
2 5 1 2 3 3	2

Explanation of sample 1.
There are two people who visit on days $1, 3, 5, 7, \ldots$ and $3, 6, 9, 12, \ldots$ respectively. Therefore the visits are as follows:

1. day 1, by person 1
2. day 3, by person 1
3. day 3, by person 2
4. day 5, by person 1
5. day 6, by person 2,

so person 2 gets the prize.

Sample input 2	Sample output 2
3 20 1 1 1 1 1 1	2

Explanation of sample 2.
Three people each visit the site every day. The first six days see 18 visits, then the three people visit the site on day 7 in order. Therefore person 1 makes the nineteenth visit and person 2 gets the prize.

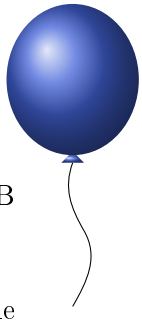
Sample input 3	Sample output 3
3 20 1 2 3 3 2 4	3

Explanation of sample 3.
There are three people:

- person 1 visits on days $1, 3, 5, 7, \ldots$
- person 2 visits on days $3, 6, 9, 12, \ldots$
- person 3 visits on days $2, 6, 10, 14, \ldots$.

The twentieth visit is made by person 3, so they win the prize.

C2 One Millionth Visitor (Full)



Time limit: 1.0s
Memory limit: 1024MB

Nadja has a website where she posts motivational quotes. There are n visitors to her website, the ith of which makes their first visit on day a_i and returns every b_i days thereafter. If several people visit her website on the same day, they do so in the order of their visitor number (i.e. their order in the input).

Nadja wants to give a special prize to mark the kth visit to her website. Help her determine who should be given the prize.

Input

The first line of input consists of two space-separated integers n ($1 \leq n \leq 1,000,000$) and k ($1 \leq k \leq 1,000,000,000,000$), representing the number of visitors and the visit number to be awarded the prize.

n lines follow, the ith of which consists of two space-separated integers a_i and b_i ($1 \leq a_i, b_i \leq 1,000,000$), representing the day of visitor i's first visit and the number of days until each subsequent visit.

Output

Output a single integer, the number of the visitor who makes the kth visit.

Samples

Sample input 1	Sample output 1
2 5 1 2 3 3	2

Explanation of sample 1.
There are two people who visit on days $1, 3, 5, 7, \ldots$ and $3, 6, 9, 12, \ldots$ respectively. Therefore the visits are as follows:

1. day 1, by person 1
2. day 3, by person 1
3. day 3, by person 2
4. day 5, by person 1
5. day 6, by person 2,

so person 2 gets the prize.

Sample input 2	Sample output 2
3 20 1 1 1 1 1 1	2

Explanation of sample 2.
Three people each visit the site every day. The first six days see 18 visits, then the three people visit the site on day 7 in order. Therefore person 1 makes the nineteenth visit and person 2 gets the prize.

Sample input 3	Sample output 3
3 20 1 2 3 3 2 4	3

Explanation of sample 3.
There are three people:

- person 1 visits on days $1, 3, 5, 7, \ldots$
- person 2 visits on days $3, 6, 9, 12, \ldots$
- person 3 visits on days $2, 6, 10, 14, \ldots$.

The twentieth visit is made by person 3, so they win the prize.