Problem A. Window

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	512 mebibytes

In the building of Jewelry Art Gallery (JAG), there is a long corridor in the east-west direction. There is a window on the north side of the corridor, and N windowpanes are attached to this window. The width of each windowpane is W, and the height is H The i-th windowpane from the west covers the horizontal range between $W \times (i-1)$ and $W \times i$ from the west edge of the window.

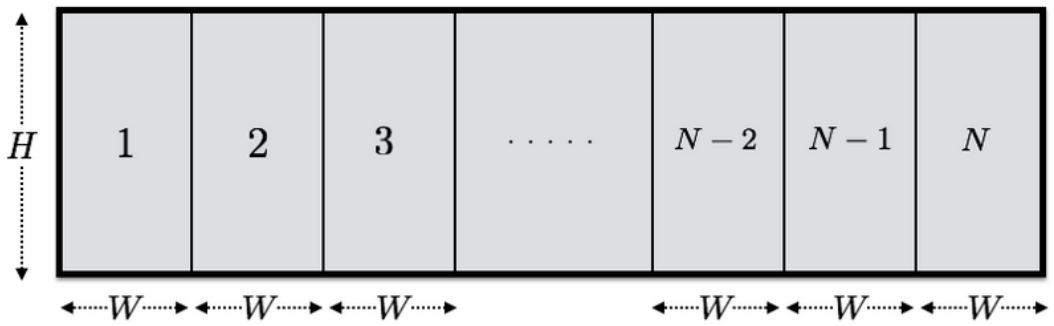


Figure A1. Illustration of the window

You received instructions from the manager of JAG about how to slide the windowpanes. These instructions consist of N integers $x_1, x_2, \ldots, x_N$, where $x_i \leq W$ is satisfied for all i. For the i-th windowpane, if i is odd, you have to slide i-th windowpane to the east by x_i, otherwise, you have to slide i-th windowpane to the west by x_i.

You can assume that the windowpanes will not collide each other even if you slide windowpanes according to the instructions. In more detail, N windowpanes are alternately mounted on two rails. That is, the i-th windowpane is attached to the inner rail of the building if i is odd, otherwise, it is attached to the outer rail of the building.

Before you execute the instructions, you decide to obtain the area where the window is open after the instructions.

Input

The first line of the input consists of three integers N, H, and W ($1 \leq N \leq 100$, $1 \leq H, W \leq 100$). It is guaranteed that N is even. The following line consists of N integers $x_1, x_2, \ldots, x_N$ while represent the instructions from the manager of JAG. x_i represents the distance to slide the i-th windowpane ($0 \leq x_i \leq W$).

Output

Print the area where the window is open after the instructions in one line.

Examples

standard input	standard output
4 3 3 1 1 2 3	9
8 10 18 2 12 16 14 18 4 17 16	370
6 2 2 0 2 2 2 2 0	8
4 1 4 3 3 2 2	6
8 7 15 5 0 9 14 0 4 4 15	189

Note

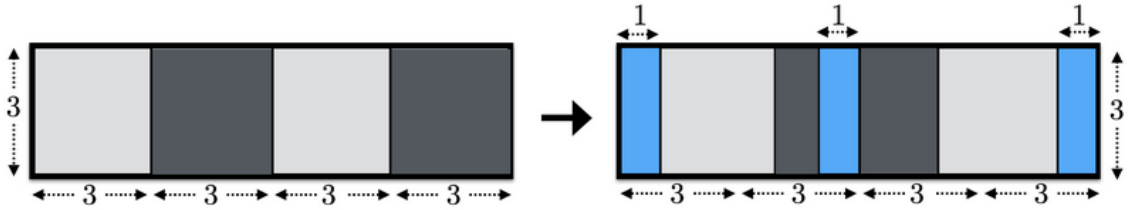


Figure A2. Illustration of Sample Input 1

Problem B. Tournament Chart

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	512 mebibytes

In 21XX, an annual programming contest, Japan Algorithmist GrandPrix (JAG) has become one of the most popular mind sports events.

JAG is conducted as a knockout tournament. This year, N N contestants will compete in JAG. A tournament chart is represented as a string. "`[[a-b]-[c-d]]`" is an easy example. In this case, there are 4 contestants named a, b, c, and d, and all matches are described as follows:

- Match 1 is the match between a and b.
- Match 2 is the match between c and d.
- Match 3 is the match between [the winner of match 1] and [the winner of match 2].

More precisely, the tournament chart satisfies the following BNF:

- <winner> ::= <person> | `[` <winner> `-` <winner> `]`
- <person> ::= `a` | `b` | `c` | ... | `z`

You, the chairperson of JAG, are planning to announce the results of this year's JAG competition. However, you made a mistake and lost the results of all the matches. Fortunately, you found the tournament chart that was printed before all of the matches of the tournament. Of course, it does not contains results at all. Therefore, you asked every contestant for the number of wins in the tournament, and got N pieces of information in the form of "The contestant a_i won v_i times.

Now, your job is to determine whether all of these replies can be true.

Input

First line of the input contains string S, which represents the tournament chart. S satisfies the above BNF. The following N linesrepresent the information of the number of wins. The $(i+1)$ -th line consists of a lowercase letter a_i and a non-negative integer v_i ($v_i \leq 26$) separated by a space, and this means that the contestant a_i won v_i times. Note that N ($2 \leq N \leq 26$) means that the number of contestants and it can be identified by string S . You can assume that each letter a_i is distinct. It is guaranteed that S contains each a_i exactly once and doesn't contain any other lowercase letters.

Output

Print "`Yes`" in one line if replies are all valid for the tournament chart. Otherwise, print "`No`" in one line.

Examples

standard input	standard output

`[[m-y]-[a-o]]`
`o 0`
`a 1`
`y 2`
`m 0`
	`Yes`

`[[r-i]-[m-e]]`
`e 0`
`r 1`
`i 1`
`m 2`
	`No`

Problem C. Prime-Factor Primes

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	512 mebibytes

A positive integer is called a "prime-factor prime" when the number of its prime factors is prime. For example, 12 is a prime-factor prime because the number of prime factors of $12 = 2 \times 2 \times 3$ is 3, which is prime. On the other hand, 210 is not a prime-factor prime because the number of prime factors of $210 = 2 \times 3 \times 5 \times 7$ is 4, which is a composite number.

In this problem, you are given an integer interval $[l, r]$. Your task is to write a program which counts the number of prime-factor prime numbers in the interval, i.e. the number of prime-factor prime numbers between l and r, inclusive.

Input

Input contains two integers l and r ($1 \leq l \leq r \leq 10^9$, which presents an integer interval $[l, r]$. You can assume that $0 \leq r - l < 10^6$.

Output

Print the number of prime-factor prime numbers in $[l, r]$.

Examples

standard input	standard output
1 9	4
10 20	6
575 57577	36172
180 180	1
9900001 10000000	60997
999000001 1000000000	592955

Note

In the first example, there are 4 prime-factor primes in $[l, r]$: 4,6,8, and 9.

Problem D. Revenge of the Broken Door

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	512 mebibytes

The JAG Kingdom consists of N cities and M bidirectional roads. The i-th road (u_i, v_i, c_i) connects the city u_i and the city v_i and have the length c_i. One day, you, a citizen of the JAG Kingdom, decided to go to the city T from the city S. However, you know that one of the roads in the JAG Kingdom is currently under construction and you cannot pass the road. You don't know which road it is. You can know whether a road is under construction only when you are in either city connected by the road.

Your task is to minimize the total length of the route in the worst case. You don't need to decide a route in advance of departure and you can choose where to go next at any time. If you cannot reach the city T in the worst case, output -1.

Input

The first line of the input contains four integers N, M ,S and T, where N is the number of the cities ($2 \leq N \leq 10^5$), M is the number of the bidirectional roads ($1 \leq M \leq 2 \cdot 10^5$), S is the city you start from ($1 \leq S \leq N$), and T is the city you want to reach to ($1 \leq T \leq N$, $S \neq T$). The following M lines represent road information: the i-th line of the M lines consists of three integers u_i, v_i, c_i which means the i-th road connects the cities u_i and v_i ($1 \leq u_i, v_i \leq N$, $u_i \neq v_i$ with the length c_i ($1 \leq c_i \leq 10^9$). You can assume that all the pairs of the cities are connected if no road is under construction. That is, there is at least one route from city x to city y with given roads, for all cities x and y. It is also guaranteed that there are no multiple-edges, i.e., $\{ui, vi\} \neq \{uj, vj\}$ for all $1 \leq i < j \leq M$.

Output

Output the minimum total length of the route in the worst case. If you cannot reach the city T in the worst case, output -1.

Examples

standard input	standard output
3 3 1 3 1 2 1 2 3 5 1 3 3	6
4 4 1 4 1 2 1 2 4 1 1 3 1 3 4 1	4
5 4 4 1 1 2 3 2 3 4 3 4 5 4 5 6	-1

Problem E. Tree Separator

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	512 mebibytes

You are given a tree T and an integer K. You can choose arbitrary distinct two vertices u and v on T. Let P be the simple path between u and v. Then, remove vertices in P, and edges such that one or both of its end vertices is in P from T. Your task is to choose u and v to maximize the number of connected components with K or more vertices of T after that operation.

Input

The first line of the input consists of two integers N, K ($2 \leq N \leq 10^5$, $1 \leq K \leq N$). The following $N-1$ lines represent the information of edges. The $(i+1)$-th line consists of two integers u_i, v_i ($1 \leq u_i, v_i \leq N$ and $u_i \leq v_i$ for each i). Each $\{u_i, v_i\}$ is an edge of T. It's guaranteed that these edges form a tree.

Output

Print the maximum number of connected components with K or more vertices in one line.

Examples

standard input	standard output
2 1 1 2	0
7 3 1 2 2 3 3 4 4 5 5 6 6 7	1
12 2 1 2 2 3 3 4 4 5 3 6 6 7 7 8 8 9 6 10 10 11 11 12	4
3 1 1 2 2 3	1
3 2 1 2 2 3	0
9 3 1 2 1 3 1 4 4 5 4 6 4 7 7 8 7 9	2

Problem F. RPG Maker

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	512 mebibytes

You are planning to create a map of an RPG. This map is represented by a grid whose size is $H \times W$. Each cell in this grid is either '`@`', '`*`', '`#`', or '`.`'. The meanings of the symbols are as follows.

- '`@`': The start cell. The story should start from this cell.
- '`*`': A city cell. The story goes through or ends with this cell.
- '`#`': A road cell.
- '`.`': An empty cell.

You have already located the start cell and all city cells under some constraints described in the input section, but no road cells have been located yet. Then, you should decide which cells to set as road cells.

Here, you want a "journey" exists on this map. Because you want to remove the branch of the story, the journey has to be unforked. More formally, the journey is a sequence of cells and must satisfy the following conditions:

1. The journey must contain as many city cells as possible.
2. The journey must consist of distinct non-empty cells in this map.
3. The journey must begin with the start cell.
4. The journey must end with one of the city cells.
5. The journey must contain all road cells. That is, road cells not included in the journey must not exist.
6. The journey must be unforked. In more detail, all road cells and city cells except for a cell at the end of the journey must share edges with the other two cells both of which are also contained in the journey. Then, each of the start cell and a cell at the end of the journey must share an edge with another cell contained in the journey.
7. You do not have to consider the order of the cities to visit during the journey.

Initially, the map contains no road cells. You can change any empty cells to road cells to make a journey satisfying the conditions above. Your task is to print a map which maximizes the number of cities in the journey.

Input

The first line of input consists of two integers N and W. H and W are guaranteed to satisfy $H = 4n - 1$ and $W = 4m = 1$ for some positive integers n and m ($1 \leq n, m \leq 10$). The following H lines represent a map without road cells. The $(i + 1)$-th line consists of a string S_i of length W. The j-th character of S_i is either '`*`', '`@` or '`.`' if both i and j are odd, otherwise '`.`. The number of occurrences of '`@`' in the grid is exactly one. It is guaranteed that there are one or more city cells on the grid.

Output

Print a map indicating a journey. If several maps satisfy the condition, you can print any of them.

Examples

standard input	standard output
11 7 .... *.....* ....@.... .... *...... ....*..	.... *######* ......# ..@...# ..#.### *##.#.. #...#.. ####*.. ....
7 11 ....*.. ....*...*.. ....*.@...*..	........*.. ....#.. ....#.. ....#.. ..##*##.*.. ..#...#.#.. ..*#@.##*..

Problem G. Coin Slider

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	512 mebibytes

You are playing a coin puzzle. The rule of this puzzle is as follows:

There are N coins on a table. The i-th coin is a circle with raduis r_i, and its center is initially placed at (sx_i, sy_i). Each coin also has a target position: you should move the i-th coin so that its center is at (tx_i, ty_i). You can move coins one by one and can move each coin at most once. When you move a coin, it must move from its initial position to its target position along the straight line. In addition, coins cannot collide with each other, including in the middle of moves.

The score of the puzzle is the number of the coins you move from their initial position to their target position. Your task is to write a program that determines the maximum score for a given puzzle instance.

Input

The first line of the input contains an integer N ($1 \leq N \leq 16$), which is the number of coins used in the puzzle. The i-th line of the following N lines consists of five integers: r_i, sx_i, sy_i, tx_i, and ty_i ($1 \leq r_i \leq 1,000$, $-1,000 \leq sx_i, sy_i, tx_i, ty_i \leq 1000$, $(sx_i, sy_i) \neq (tx_i, ty_i)$. They describe the information of the i-th coin: r_i is the radius of the i-th coin, (sx_i, sy_i) is the initial position of the i-th coin, and (tx_i, ty_i) is the target position of the i-th coin.

You can assume that the coins do not contact or are not overlapped with each other at the initial positions. You can also assume that the maximum score does not change even if the radius of each coin changes by 10^{-5}.

Output

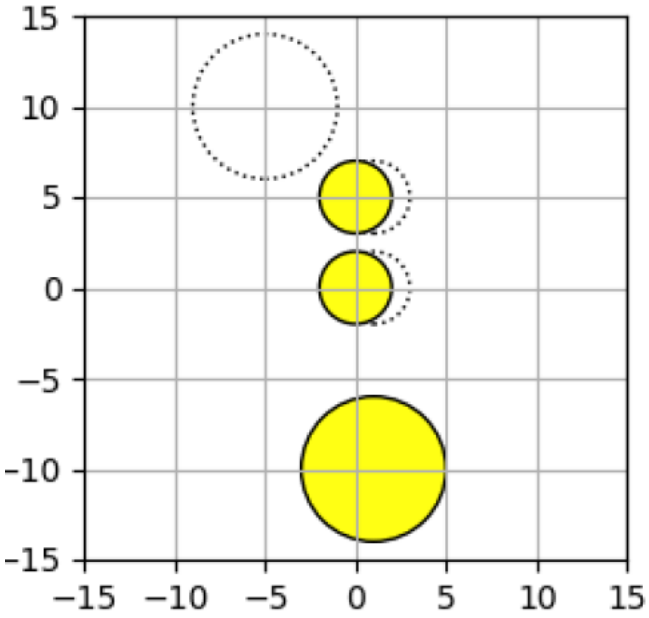
Print the maximum score of the given puzzle instance in a line.

Examples

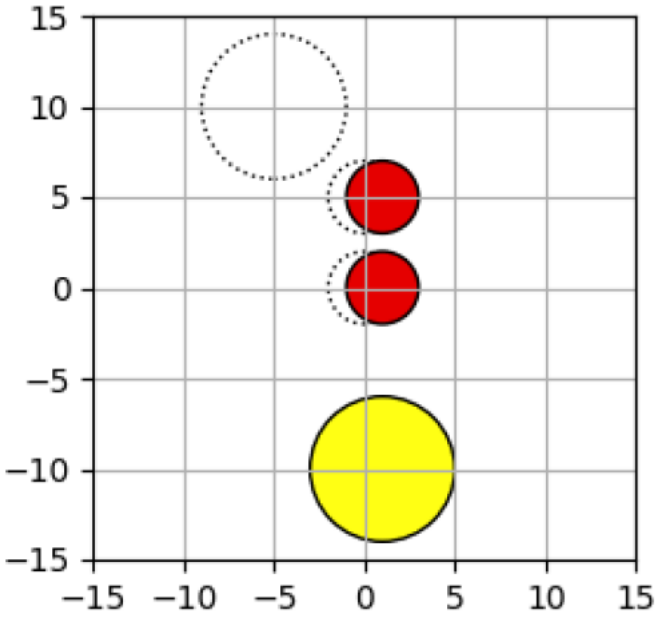
standard input	standard output
3 2 0 0 1 0 2 0 5 1 5 4 1 -10 -5 10	2
3 1 0 0 5 0 1 0 5 0 0 1 5 5 0 5	3
4 1 0 0 5 0 1 0 5 0 0 1 5 5 0 5 1 5 0 0 0	0

Note

In the first example, the third coin cannot move because it is disturbed by the other two coins.



Example 1. Initial Positions



Example 1. After Movements

Problem H. Separate String

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	512 mebibytes

You are given a string t and a set S of N different strings. You need to separate t such that each part is included in S.

For example, the following 4 separation methods satisfy the condition when $t = abab$ and $S = \{a, ab, b\}$.

- "a","b","a","b"
- "a","b","ab"
- "ab","a","b"
- "ab","ab"

Your task is to count the number of ways to separate t. Because the result can be large, you should output the remainder divided by $10^9 + 7$.

Input

The first line of the input consists of an integer N ($1 \leq N \leq 10^5$) which is the number of the elements of S. The following N lines consist of N distinct strings separated by line breaks. The i-th string s_i represents the i-th element of S. s_i consists of lowercase letters and the length is between 1 and 10^5, inclusive. The summation of length of s_i ($1 \leq i \leq N$) is at most $2 \cdot 10^5$. The next line consists of a string t which consists of lowercase letters and represents the string to be separated and the length is between 1 and 10^5, inclusive.

Output

Calculate the number of ways to separate t and print the remainder divided by $10^9 + 7$.

Examples

standard input	standard output
3 a b ab abab	4
3 a b c xyz	0
7 abc ab bc a b c aa aaabcbccababbc	160
10 a aa aaa aaaa aaaaa aaaaaa aaaaaaa aaaaaaaa aaaaaaaaa aaaaaaaaaa aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa	461695029

Problem I. Revenge by Endless BFS

Input file:	*standard input*
Output file:	*standard output*
Time limit:	4 seconds
Memory limit:	512 mebibytes

Mr. Endo wanted to write the code that performs breadth-first search (BFS), which is a search algorithm to explore all vertices on a *directed* graph. An example of pseudo code of BFS is as follows:

```
1: current ← {start_vertex}
2: visited ← current
3: while visited ≠ the set of all the vertices
4:   found ← {}
5:   for u in current
6:     for each v such that there is an edge from u to v
7:       found ← found ∪ {v}
8:   current ← found \ visited
9:   visited ← visited ∪ found
```

However, Mr. Endo apparently forgot to manage visited vertices in his code. More precisely, he wrote the following code:

```
1: current ← {start_vertex}
2: while current ≠ the set of all the vertices
3:   found ← {}
4:   for u in current
5:     for each v such that there is an edge from u to v
6:       found ← found ∪ {v}
7:   current ← found
```

You may notice that for some graphs, Mr. Endo's program will not stop because it keeps running infinitely. Notice that it does not necessarily mean the program cannot explore all the vertices within finite steps. Your task here is to make a program that determines whether Mr. Endo's program will stop within finite steps for a given directed graph in order to point out the bug to him. Also, calculate the minimum number of loop iterations required for the program to stop if it is finite. Since the answer might be huge, thus print the answer modulo $10^9 + 7$, which is a prime number.

Input

The first line of the input consists of two integers N ($2 \leq N \leq 500$) and M ($1 \leq M \leq 200,000$), where N is the number of vertices and M is the number of edges in a given directed graph, respectively. The i-th line of the following M lines consists of two integers u_i and v_i ($1 \leq u_i, v_i \leq N$), which means there is an edge from u_i to v_i in the given graph. The vertex 1 is the start vertex, i.e. *start_vertex* in the pseudo codes. You can assume that the given graph also meets the following conditions.

- The graph has no self-loop, i.e., $u_i \neq v_i$ for all $1 \leq i \leq M$.
- The graph has no multi-edge, i.e., $(u_i, v_i) \leq (u_j, v_j)$ for all $1 \leq i < j \leq M$.
- For each vertex v, there is at least one path from the start vertex 1 to v.

Output

If Mr. Endo's wrong BFS code cannot stop within finite steps for the given input directed graph, print -1 in a line. Otherwise, print the minimum number of loop iterations required to stop modulo $10^9 + 7$.

Examples

standard input	standard output
4 4 1 2 2 3 3 4 4 1	-1
4 5 1 2 2 3 3 4 4 1 1 3	7
5 13 4 2 2 4 1 2 5 4 5 1 2 1 5 3 4 3 1 5 4 5 2 3 5 2 1 3	3

Problem J. Farm Village

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	512 mebibytes

There is a village along a road. This village has N houses numbered 1 to N in order along the road. Each house has a field that can make up to two units of the crop and needs just one unit of the crop. The total cost to distribute one unit of the crop to each house is the summation of carrying costs and growing costs.

- The carrying cost: The cost to carry one unit of the crop between the i-th house and the $(i+1)$-th house is d_i. It takes the same cost in either direction to carry.
- The growing cost: The cost to grow one unit of the crop in the i-th house's field is g_i.

Your task is to calculate the minimum total cost to supply one unit of the crop to each house.

Input

The first line of the input consists of an integer N ($2 \leq 2 \cdot 10^5$), which is the number of the houses. The second line consists of $N-1$ integers separated by spaces. The i-th integer d_i ($1 \leq d_i \leq 10^9$, $1 \leq i \leq N-1$) represents the carrying cost between the i-th and the $(i+1)$-th houses. The third line consists of N integers separated by spaces. The i-th integer g_i ($1 \leq g_i \leq 10^9$, $1 \leq i \leq N$) represents the growing cost of the i-th house's field.

Output

Print the minimum cost to supply one unit of the crop to each house.

Example

standard input	standard output
2 3 1 5	5
3 100 100 1 2 3	6
4 1 2 3 1 1 100 100	12

Problem K. Conveyor Belt

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	512 mebibytes

Awesome Conveyor Machine (ACM) is the most important equipment of a factory of *Industrial Conveyor Product Corporation* (ICPC). ACM has a long conveyor belt to deliver their products from some points to other points. You are a programmer hired to make efficient schedule plan for product delivery.

ACM's conveyor belt goes through N points at equal intervals. The conveyor has plates on each of which at most one product can be put. Initially, there are no plates at any points. The conveyor belt moves by exactly one plate length per unit time; after one second, a plate is at position 1 while there are no plates at the other positions. After further 1 seconds, the plate at position 1 is moved to position 2 and a new plate comes at position 1, and so on. Note that the conveyor has the unlimited number of plates: after N seconds or later, each of the N positions has exactly one plate.

A delivery task is represented by positions a and b; delivery is accomplished by putting a product on a plate on the belt at a, and retrieving it at b after $b - a$ seconds ($a < b$). (Of course, it is necessary that an empty plate exists at the position at the putting time.) In addition, putting and retrieving products must be done in the following manner:

- When putting and retrieving a product, a plate must be located just at the position. That is, products must be put and retrieved at integer seconds.
- Putting and retrieving at the same position *cannot* be done at the same time. On the other hand, putting and retrieving at the different positions can be done at the same time.

If there are several tasks, the time to finish all the tasks may be reduced by changing schedule when each product is put on the belt. Your job is to write a program minimizing the time to complete all the tasks... wait, wait. When have you started misunderstanding that you can know all the tasks initially? New delivery requests are coming moment by moment, like plates on the conveyor! So you should update your optimal schedule per every new request.

A request consists of a start point a, a goal point b, and the number p of products to deliver from a to b. Delivery requests will be added Q times. Your (true) job is to write a program such that for each $1 \leq i \leq Q$, minimizing the entire time to complete delivery tasks in requests 1 to i.

Input

The first line of the input includes two integers N and Q ($2 \leq N \leq 10^5, 1 \leq Q \leq 10^5$): N is the number of positions the conveyor belt goes through and Q is the number of requests will come. The i-th line of the following Q lines consists of three integers a_i, b_i, and p_i ($1 \leq a_i < b_i \leq N, 1 \leq p_i \leq 10^9$), which mean that the i-th request requires p_i products to be delivered from position a_i to position b_i.

Output

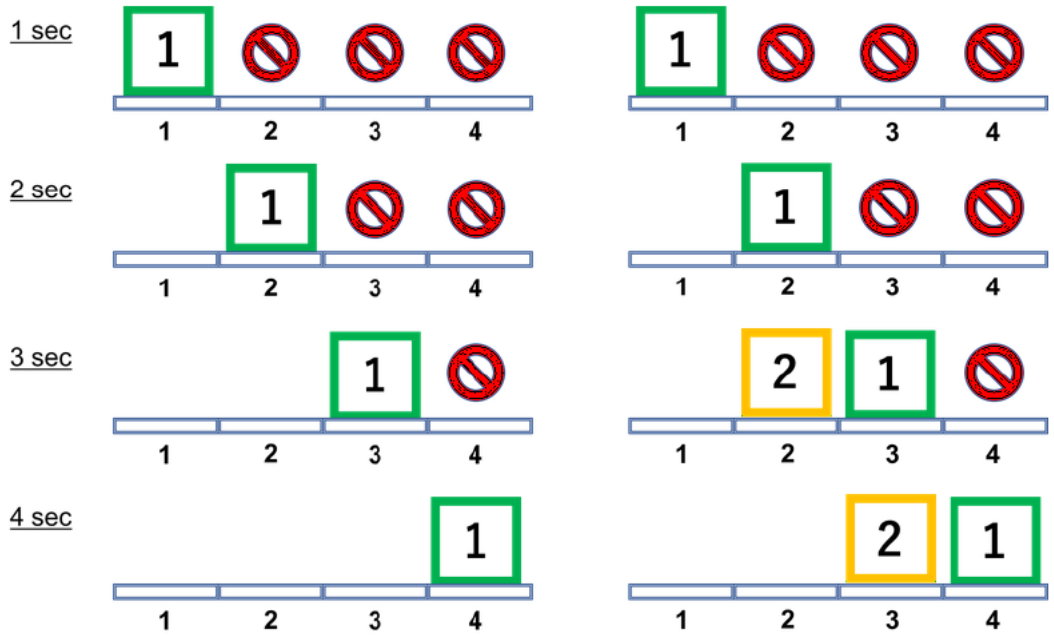
In the i-th line, print the minimum time to complete all the tasks required by requests 1 to i.

Examples

standard input	standard output
5 2 1 4 1 2 3 1	4 4
5 2 1 4 1 2 3 5	4 8
5 2 1 3 3 3 5 1	5 6
10 4 3 5 2 5 7 5 8 9 2 1 7 5	6 11 11 16

Note

Regarding the first example, the minimum time to complete only the first request is 4 seconds. All the two requests can be completed within 4 seconds too (see the figure).



Problem L. Rock Climbing

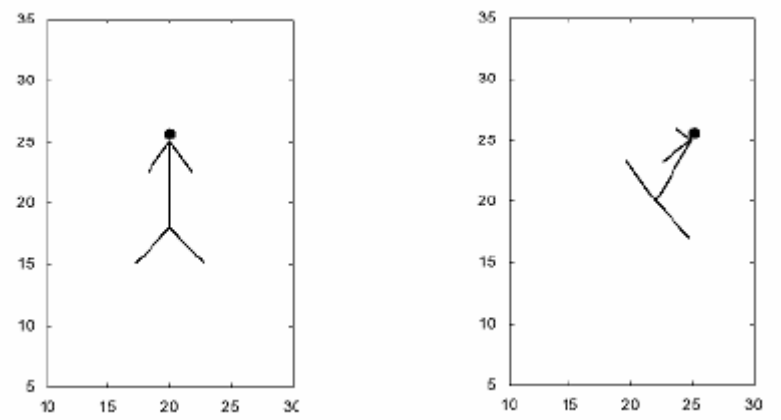
Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	512 mebibytes

Bouldering is a style of rock climbing. Boulderers are to climb up the rock with bare hands without supporting ropes.

The bouldering school asked you to write the program which simulates the way boulderer climbs up and checks whether he can climb up to the goal successfully.

For the sake of convenience, we assume that a boulderer consists of 5 line segments, representing his body, his right arm, his left arm, his right leg, and his left leg.

One of his end of the body is connected to his arms on their end points. And the other end of the body is connected to his legs on their end points, too. The maximum length of his body, his arms, and his legs are A, B and C respectively. He climbs up the wall by changing the length of his body parts from 0 to their maximum length, and by twisting them in any angle (in other word, 360 degrees). Refer the following figure representing the possible body arrangements.



5 line segments representing his body, arms and legs ($A = 8$, $B = 3$, and $C = 4$). The picture describes his head as a filled circle for better understanding, which has no meaning in this problem.

A boulderer climbs up the wall by grabbing at least three different rocks on the wall with his hands and feet. In the initial state, he holds 4 rocks with his hands and feet. Then he changes one of the holding rocks by moving his arms and/or legs. This is counted as one movement. His goal is to grab a rock named "destination rock" with one of his body parts. The rocks are considered as points with negligible size. You are to write a program which calculates the minimum number of movements required to grab the destination rock.

Input

The first line of the input contains one integer n ($5 \leq n \leq 30$), which represents the number of rocks.

The second line contains three integers A, B, C ($1 \leq A, B, C \leq 50$), which represent the length of body, arms, and legs of the climber respectively.

The last n lines describes the location of the rocks. The i-th contains two integers x_i and y_i ($0 \leq x_i, y_i \leq 100$), representing the x and y-coordinates of the i-th rock.

In the initial state, the boulderer is grabbing the 1st rock with his right hand, 2nd with his left hand, 3rd with his right foot, and 4th with left foot.

You may assume that the first 4 rocks are close to each other so that he can grab them all in the way described above.

The last rock is the destination rock.

Output

Your program should output the minimum number of movements to reach the destination stone.

If it is impossible to grab the destination stone, output -1.

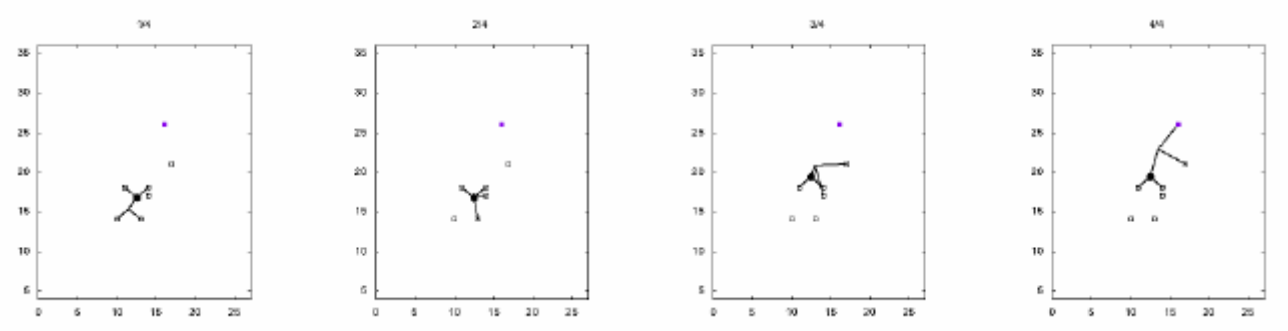
You may assume that, if A, B, and C would be changed within 0.001, the answer would not change.

Examples

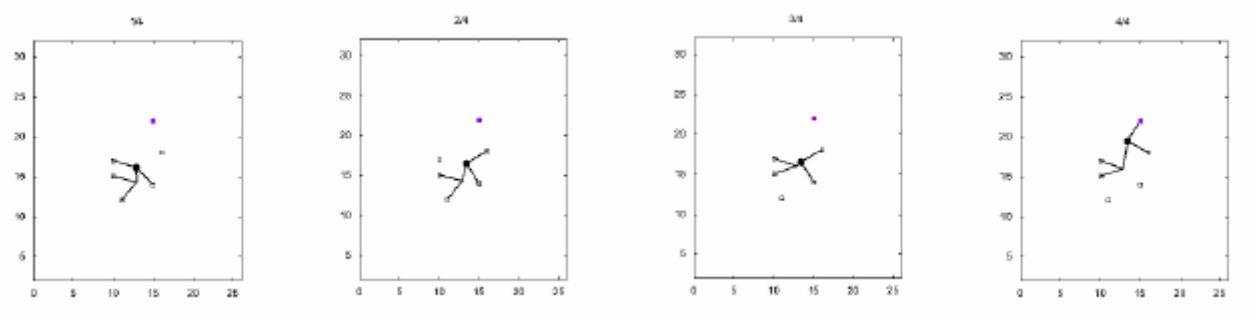
standard input	standard output
6 4 3 3 10 17 15 14 10 15 11 12 16 18 15 22	3
7 4 2 4 11 18 14 18 10 14 13 14 14 17 17 21 16 26	3
6 2 2 4 12 22 13 21 14 15 10 16 16 24 10 35	-1
6 2 3 3 11 22 12 20 10 15 11 17 13 23 16 22	-1

Note

Following figures represent just an example of how the boulderer climbs up to the destination in minimum number of movements. Note that the minimum number of movements can be obtained, by taking different way of climbing up, shortening the parts, rotating parts etc.



An example of minimum movement for sample input 1.



An example of minimum movement for sample input 2.

Problem M. Controlled Patterns

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	512 mebibytes

Given a $N \times N$ grid with N tokens placed on it is called *controlled pattern*, if any vertical, horizontal or diagonal line of length N contains atleast one token.

Your task in this problem is to write a program counting how many such positions is possible if we know that some (possibly zero) grid cells are declared to be free from tokens.

Input

The input begins with a line containing two numbers N ($1 \le N \le 32$) and K ($0 \le K \le 8$), which represent the size of the grid and the number of token-free squares. Then K lines follow, each containing two numbers x_i and y_i to indicate the square at (x_i, y_i) is token-free. The coordinate values are zero-based (i.e. $0 \le xi, yi \le N - 1$). No pair of marked squares coincides.

Output

Count the number of possible controlled patterns with exactly N tokens that can be made from the given initial board and set of token-free cells, and print the number in modulo 10007 in a line (since it is supposed to be huge). Rotated and mirrored patterns should be regarded as different and counted each.

Example

standard input	standard output
4 2 0 2 3 1	6
4 2 2 3 3 2	6
10 3 0 0 4 4 1 4	1127