The 2nd Universal Cup

Stage 13: Sendai

October 19-20, 2024

This problem set should contain 15 problems on 26 numbered pages.

Problem A. 012 Grid

Time limit: 2 seconds
Memory limit: 1024 megabytes

You are given a grid with H rows and W columns. Your task is to count the number of ways to assign an integer to each cell of the grid such that the following conditions are satisfied: Let $X_{h,w}$ denote the integer assigned to the cell at the h-th row from the top and w-th column from the left:

- Each cell must have exactly one integer assigned to it.
- For each h and w where $1 \le h \le H$ and $1 \le w \le W$, the condition $X_{h,w} \in \{0, 1, 2\}$ holds.
- For each h and w where $1 \le h \le H - 1$ and $1 \le w \le W$, the condition $X_{h+1,w} - X_{h,w} \in \{0, 1\}$ holds.
- For each h and w where $1 \le h \le H$ and $1 \le w \le W - 1$, the condition $X_{h,w+1} - X_{h,w} \in \{0, 1\}$ holds.
- For each h and w where $1 \le h \le H-1$ and $1 \le w \le W-1$, the condition $X_{h+1,w+1} - X_{h,w} \in \{0, 1\}$ holds.

Determine the number of ways to assign integers to the grid that satisfy all of these conditions, and output the answer modulo 998244353.

Input

The input is given from Standard Input in the following format:

```
H W
```

- $1 \le H \le 2 \times 10^5$
- $1 \le W \le 2 \times 10^5$
- All input values are integers.

Output

Print the answer in a single line.

Examples

standard input	standard output
2 2	11
20 23	521442928
200000 200000	411160917

Note

In the first example, among the 11 possible ways to fill the grid, the following three satisfy the conditions.

```
00 01 11
00 11 22
```

Problem B. Topological Sort

Time limit: 2 seconds
Memory limit: 1024 megabytes

You are given a positive integer N and a permutation $P = (P_1, P_2, \ldots, P_N)$ of $(1, 2, \ldots, N)$.

Find the number of directed graphs with N vertices labeled with $1, 2, \ldots, N$ and unlabeled edges, satisfying the following conditions:

- The graph is a simple DAG. That is, it does not contain directed cycles nor multiple edges.
- The lexicographically smallest topological ordering of the vertices is P.

Output the answer modulo 998244353.

Input

The input is given from Standard Input in the following format:

```
N
P_1 P_2 ... P_N
```

- $2 \leq N \leq 2 \times 10^5$
- $(P_1, P_2, \ldots, P_N)$ is a permutation of $(1, 2, \ldots, N)$.
- All input values are integers.

Output

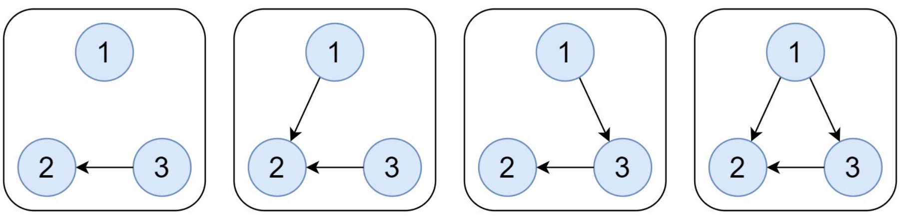
Print the answer in a single line.

Examples

standard input	standard output
3 1 3 2	4
5 1 2 3 4 5	1024
6 4 2 1 5 6 3	4096

Note

In the first example, the following four directed graphs satisfy the conditions.



Problem C. Shift Puzzle

Time limit: 2 seconds
Memory limit: 1024 megabytes

There are two $N \times N$ grids S and T, where each cell is either black or white. The color of each grid is represented by N^2 characters. In grid S, if the cell in the x-th row from the top and the y-th column from the left is black, $S_{x,y}$ is `#`, and if it is white, $S_{x,y}$ is `.`(period). The same applies to T.

You can perform the following operations on the grid S:

- Choose integers t and x $(1 \le t \le 2, 1 \le x \le N)$.
- If $t = 1$, perform a cyclic right shift by 1 on the x-th row of S. Specifically, replace $S_{x,1}S_{x,2} \dots S_{x,N}$ with $S_{x,N}S_{x,1} \dots S_{x,N-1}$ simultaneously.
- If $t = 2$, perform a cyclic downward shift by 1 on the x-th column of S. Specifically, replace $S_{1,x}S_{2,x} \dots S_{N,x}$ with $S_{N,x}S_{1,x} \dots S_{N-1,x}$ simultaneously.

Determine whether S can be transformed into T using at most N^3 operations. If possible, output one sequence of operations to achieve this transformation.

Input

The input is given from Standard Input in the following format:

N
$S_{1,1} \dots S_{1,N}$
$\vdots$
$S_{N,1} \dots S_{N,N}$
$T_{1,1} \dots T_{1,N}$
$\vdots$
$T_{N,1} \dots T_{N,N}$

- $2 \le N \le 80$
- $S_{x,y}, T_{x,y}$ are `#` or `.`(period).
- N is an integer.

Output

If it is impossible to match the grids with at most N^3 operations, output `No`.

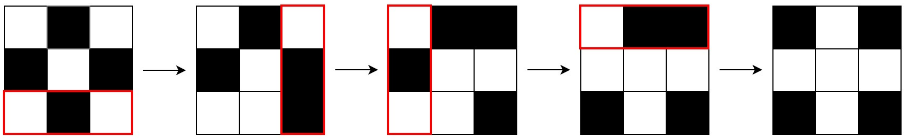
If it is possible, output `Yes` on the first line, and the number of operations $M (0 \le M \le N^3)$ on the second line. From the third line to the $(M+2)$-th line, output the sequence of operations. On the $(i+2)$-th line, output the chosen t and x for the i-th operation in this order.

Examples

standard input	standard output
3 .#. #.# .#. #.# ... #.#	Yes 4 1 3 2 3 2 1 1 1
3 .#. #.# .#. .#. #.# .#.	Yes 0
13 ....#####.... ......#...... ......#...... ......#...... ......#...... ....#...#.... ....#...#.... ....#...#.... ....#...#.... .....###..... ....####..... ....#...#.... ....####..... ....#........ ....#........ ....###..... ....#...#.... ....#........ ....#...#.... .....###.....	No

Note

In the first example, S changes as follows:



Problem D. And DNA

Time limit: 2 seconds
Memory limit: 1024 megabytes

Given two integers N and M, count the number of sequences $A = (A_1, A_2, \ldots, A_N)$ of length N where each A_i is an integer between 0 and M (inclusive), that satisfy the following condition:

- For all $i = 1, 2, \ldots, N$, $A_i + (A_{i-1} \& A_{i+1}) = M$ holds, where $A_0 := A_N$ and $A_{N+1} := A_1$. Here, & denotes the bitwise AND operation.

Output the answer modulo 998244353.

Input

The input is given from Standard Input in the following format:

N M

- $3 \le N \le 10^9$
- $0 \le M \le 10^9$
- All input values are integers.

Output

Print the answer in a single line.

Examples

standard input	standard output
3 2	4
3 0	1
100 100	343406454

Note

In the first example, there are 4 sequences that satisfy the condition: $(0, 2, 2), (2, 0, 2), (2, 2, 0), (1, 1, 1)$.

In the second example, the only sequence that satisfies the condition is $(0, 0, 0)$.

Problem E. Hotel

Time limit: 2 seconds
Memory limit: 1024 megabytes

You have an integer sequence $A = (1)$ of length 1. You will receive Q queries, which you need to process in order.

There are three types of queries:

Let n be the length of the sequence A before each query, and let $A = (a_1, a_2, \ldots, a_n)$.

- $1\ x$: Replace A with the sequence of length $n+1$ as $(x, a_1, a_2, \ldots, a_n)$.
- $2\ x$: Replace A with the sequence of length $2n$ as $(x, a_1, x, a_2, \ldots, x, a_n)$.
- $3\ x$: If $x > n$, output -1. If $x \le n$, output a_x.

Input

The input is given from Standard Input in the following format:

$$
\begin{array}{l}
Q \\
t_1\ x_1 \\
t_2\ x_2 \\
\vdots \\
t_Q\ x_Q
\end{array}
$$

Here, t_i $(1 \le i \le Q)$ is an integer representing the type of query and is either $t_i = 1, 2$, or 3.

- $1 \le Q \le 2 \times 10^5$
- $1 \le x \le 10^9$
- There is at least one output query.
- All input values are integers.

Output

Print q lines, where q is the number of queries that satisfy $t_i = 3$. On the j-th line $(1 \le j \le q)$, output the result of the j-th query of type 3.

Examples

standard input	standard output
6 1 4 3 3 1 3 3 2 2 3 3 2	-1 4 3
8 1 8 2 5 2 5 3 7 3 8 3 9 2 3 3 1	5 1 -1 3

Note

In the first example, A changes as follows:

- Before Query 1: $A = (1)$
- After Query 1: $A = (4, 1)$
- After Query 2: $A = (4, 1)$
- After Query 3: $A = (3, 4, 1)$
- After Query 4: $A = (3, 4, 1)$
- After Query 5: $A = (3, 3, 3, 4, 3, 1)$
- After Query 6: $A = (3, 3, 3, 4, 3, 1)$

Problem F. Min Nim

Time limit: 2 seconds
Memory limit: 1024 megabytes

There are N piles of stones, with the i-th pile containing A_i stones initially. Anna and Bob play a game using these piles.

In the game, Anna goes first, and the two players take turns performing the following operation:

1. Select a pile i ($1 \le i \le N$) that contains at least one stone.
2. Remove one or more stones from the i-th pile, so that after the operation, the number of stones remaining in the i-th pile must equal the minimum of the number of stones remaining in any of the piles. More formally, after performing the operation, the following condition must be satisfied:

$$A'_i = \min\{A'_1, A'_2, \dots, A'_N\},$$

where A'_j denote the number of stones remaining in the j-th pile after the operation ($A'_j = 0$ if the j-th pile is empty).

The player who cannot make a move loses, and the player who does not lose wins. Determine which player will win if both play optimally.

Answer T test cases.

Input

The input is given from Standard Input in the following format:

```
T
case_1
case_2
⋮
case_T
```

Each test case is given in the following format:

```
N
A_1 A_2 ... A_N
```

- $1 \le T$
- $1 \le N \le 10^5$
- $1 \le A_i \le 10^9$ ($i = 1, 2, \dots, N$)
- The sum of N in all test cases does not exceed 10^5.
- All input values are integers.

Output

Output T lines. On the i-th line, print the winner for the i-th test case. If Anna wins, print "`First`", otherwise print "`Second`".

Example

standard input	standard output
2 3 3 1 4 8 3 1 4 1 5 9 2 6	First Second

Note

In the first test case, on the first turn, Anna can perform one of the following operations:

- Remove two or more stones from the first pile.
- Remove one or more stones from the second pile.
- Remove three or more stones from the third pile.

Problem G. Count Pseudo-Palindromes

Time limit: 3 seconds
Memory limit: 1024 megabytes

A sequence $B = (B_1, B_2, \ldots, B_M)$ of length M is called a **palindrome** if $B_i = B_{M+1-i}$ holds for all $i = 1, 2, \ldots, M$.

A sequence B is called a **pseudo-palindrome** if there exists a permutation of B that is a palindrome.

You are given a sequence $A = (A_1, A_2, \ldots, A_{2N})$ of length $2N$, where each number from 1 to N appears exactly twice.

For each of $i = 1, 2, \ldots, 2N$, count the number of pairs of integers $(l, r)\,(1 \le l \le r \le 2N)$ satisfying the following conditions:

1. $l \le i \le r$
2. The number A_i appears exactly once in $(A_l, A_{l+1}, \ldots, A_r)$.
3. $(A_l, A_{l+1}, \ldots, A_r)$ is a pseudo-palindrome.

Input

The input is given from Standard Input in the following format:

```
N
A_1 A_2 ... A_2N
```

- $1 \le N \le 5 \times 10^5$
- Each of $1, 2, \ldots, N$ appears exactly twice in A.
- All input values are integers.

Output

Let X_i denote the answer for i. Print $X_1, X_2, \ldots, X_{2N}$ in this order, separated by a space.

Examples

standard input	standard output
2 1 1 2 2	1 2 2 1
3 2 1 2 3 1 3	1 2 2 2 2 1
4 1 2 4 3 4 1 3 2	1 2 1 2 1 3 1 1
1 1 1	1 1

Note

In the first example, the pairs that satisfy the conditions for each i are:

- $i = 1$: $(1, 1)$
- $i = 2$: $(2, 2), (2, 4)$

- $i = 3$: $(1, 3), (3, 3)$
- $i = 4$: $(4, 4)$

Problem H. Maximize Array

Time limit: 2 seconds
Memory limit: 1024 megabytes

You are given a sequence of positive integers $A = (A_1, A_2, \ldots, A_N)$ of length N and a positive integer K. Find the lexicographically greatest sequence that can be obtained by applying the following operation to A zero or more times:

- Delete a contiguous subsequence of length K from A. Specifically, select an integer i (where $1 \leq i \leq |A| - K + 1$, $|A|$ is the length of A) and replace $A = (A_1, A_2, \ldots, A_{|A|})$ with $(A_1, \ldots, A_{i-1}, A_{i+K}, \ldots, A_{|A|})$.

Input

The input is given from Standard Input in the following format:

```
N K
A_1 A_2 ... A_N
```

- $2 \leq N \leq 3 \times 10^5$
- $1 \leq K \leq N - 1$
- $1 \leq A_i \leq N$
- All input values are integers.

Output

Print the answer in a single line.

Examples

standard input	standard output
9 3 1 2 3 4 1 2 3 4 1	4 4 1
6 1 1 6 4 2 3 5	6 5
6 5 6 5 4 3 2 1	6 5 4 3 2 1

Note

In the first example, the following is one possible sequence of operations that obtains a lexicographically greatest sequence.

- $(1, 2, 3, 4, \underline{1}, \underline{2}, \underline{3}, 4, 1) \rightarrow (\underline{1}, \underline{2}, \underline{3}, 4, 4, 1) \rightarrow (4, 4, 1)$

Problem I. Colored Complete Graph

Time limit: 2 seconds
Memory limit: 1024 megabytes

This is an interactive problem, and the judge is adaptive.

There is a complete undirected graph G with N vertices. Each edge is colored either red or blue, but the colors are hidden.

You can ask up to $2N$ questions of the following type:

- Ask the color of the edge (i, j) connecting vertex i and vertex j $(1 \leq i, j \leq N, i \neq j)$.

Output one spanning tree of the graph G where all edges are colored the same. It is guaranteed that such a spanning tree exists under the constraints of the problem.

Note that the output is not counted towards the number of questions.

Interaction Protocol

First, read an integer N from the standard input: the number of vertices in the graph $(2 \leq N \leq 5 \times 10^4)$.

```
N
```

After that, you can ask questions. To ask the color of the edge (i, j) connecting vertex i and vertex j $(1 \leq i, j \leq N, i \neq j)$, print a line formatted as follows (with a newline at the end):

```
? i j
```

If the question is valid, you will receive a response c : the color of the edge (i, j), which will be `R` if the edge is red or `B` if the edge is blue.

```
c
```

If the question is invalid due to an incorrect format or exceeding the allowed number of questions, you will receive an `F` instead.

```
F
```

In this case, your submission will be judged incorrect, and the judging program will terminate.

When you have determined the spanning tree T to output, print the answer in the following format (with a newline at the end). Each edge (u_i, v_i) should be output as follows:

```
!
u_1 v_1
u_2 v_2
⋮
u_{N-1} v_{N-1}
```

The answer will be considered correct only if all of the following conditions are met:

- $1 \leq u_i, v_i \leq N$, $u_i \neq v_i$
- The graph consisting of the $N-1$ edges and their vertices is a spanning tree of G.
- All $N-1$ edges are colored the same.

Once the answer is received, the judging program will terminate regardless of whether the answer is correct or incorrect.

Example

standard input	standard output
3	
	? 1 2
R	
	? 1 3
B	
	? 2 3
R	
	!
	1 2
	2 3

Problem J. (mod N + 1)

Time limit: 2 seconds
Memory limit: 1024 megabytes

You are given a positive integer N and a non-negative integer R .

You want to fill each cell of an $N \times N$ grid using each integer from 1 to N^2 exactly once while satisfying the following condition:

- For any 2×2 square, the remainder of the product of its four integers when divided by $N^2 + 1$ equals R.

Determine if it's possible to fill in numbers to satisfy the condition, and if so, output one example.

You have T test cases to solve.

Input

The input is given from Standard input in the following format, where case_i represents the i-th test case:

T
case_1
case_2
$\vdots$
case_T

Each case is given in the following format:

N R

- $1 \le T \le 100$
- $1 \le N \le 50$
- $0 \le R \le N^2$
- All input values are integers

Output

Output the answers to each test case in order, line-separated.

For each test case, if it's impossible to fill in numbers to satisfy the condition, output `No`. Otherwise, output one solution in the following format:

```
Yes
```
$P_{1,1}$ $P_{1,2}$ $\ldots$ $P_{1,N}$
$\vdots$
$P_{N,1}$ $P_{N,2}$ $\ldots$ $P_{N,N}$

Here, $P_{i,j}$ represents the integer which is written in the square which is i-th from the top and j-th from the left.

You must meet the following conditions:

- For any i, j $(1 \le i \le N-1, 1 \le j \le N-1)$, $P_{i,j} \times P_{i+1,j} \times P_{i,j+1} \times P_{i+1,j+1} \equiv R \pmod{N^2+1}$.

Example

standard input	standard output
3 2 4 3 3 4 2	Yes 1 2 3 4 No Yes 7 4 10 13 1 11 16 6 5 9 12 8 3 15 14 2

Problem K. Random Mex

Time limit: 2 seconds
Memory limit: 1024 megabytes

Repeat the following operation N times: select an integer between 0 and $M-1$ uniformly at random. These selections are independent.

Let A_i be the integer selected in the i-th operation. Calculate the expected value of $\text{mex}(A_1, A_2, \ldots, A_N)$ and output it modulo 998244353. Here, $\text{mex}(A_1, A_2, \ldots, A_N)$ denotes the smallest non-negative integer not present in $A_1, A_2, \ldots, A_N$.

Definition of expected value modulo 998244353:

It can be proven that expected value sought in this problem will always be a rational number. Also, in the constraints of this problem, it is guaranteed that when the sought expected value is expressed in the form of an irreducible fraction $\frac{y}{x}$, x is not divisible by 998244353. In this case, there exists a unique $0 \le z < 998244353$ satisfying $y \equiv xz \pmod{998244353}$, so output z.

Input

The input is given from Standard Input in the following format:

```
T
case_1
case_2
⋮
case_T
```

Each case is given in the following format:

```
N M
```

- $1 \le T \le 3 \times 10^5$
- $1 \le N, M \le 8000$
- All input values are integers.

Output

For each test case, output a single integer — the answer to the test case modulo 998244353.

Example

standard input	standard output
4 3 2 1 1 20 23 8000 8000	374341634 1 111675632 994279778

Note

In the first test case, possible A's are $(0,0,0), (0,0,1), (0,1,0), (0,1,1), (1,0,0), (1,0,1), (1,1,0)$ and $(1,1,1)$. The corresponding values of mex are $1,2,2,2,2,2,2$ and 0. So the expected value is $\frac{13}{8}$.

Problem L. Vivid Colors

Time limit: 3 seconds
Memory limit: 1024 megabytes

RGB values specify colors by assigning values between 0 and 255 to each of the colors Red, Green, and Blue.

For example, if $(R, G, B) = (0, 0, 128)$, the color is navy, and if $(R, G, B) = (255, 255, 0)$, the color is yellow. Additionally, if all R, G, and B values are the same, the color is monochromatic, such as white, gray, or black.

Considering that 256^3 possible colors are insufficient, Aoba-san devised an extended RGB model where each parameter can take a real value between 0 and 2×10^5.

There are N paints on the palette, and the extended RGB values of the i-th color are (r_i, g_i, b_i) in order.

For a color with extended RGB values (r, g, b), its **vividness** is defined by the variance of (r, g, b). For instance, if $(r, g, b) = (0, 120, 480)$, the vividness is $\frac{(0-200)^2+(120-200)^2+(480-200)^2}{3} = 41600$. Aoba-san wants to create a vivid color by mixing some of the paints on the palette.

When multiple colors are mixed simultaneously, a color whose extended RGB values are the average of the original colors is produced. Formally, when mixing k colors with extended RGB values $(r_1, g_1, b_1), \ldots, (r_k, g_k, b_k)$, the extended RGB value of the mixed color will be $\left(\frac{r_1+\ldots+r_k}{k}, \frac{g_1+\ldots+g_k}{k}, \frac{b_1+\ldots+b_k}{k}\right)$. Note that the parameter values after mixing can be non-integer.

You are given N paints on the palette. Find the maximum possible vividness of a color that can be obtained by mixing *exactly* k of these paints simultaneously, and output this vividness modulo 998244353.

Solve the above problem for $k = 1, 2, \ldots, N$.

Definition of vividness modulo 998244353:

It can be proven that the vividness sought in this problem will always be a rational number. Also, in the constraints of this problem, it is guaranteed that when the sought vividness is expressed in the form of an irreducible fraction $\frac{y}{x}$, x is not divisible by 998244353. In this case, there exists a unique $0 \leq z < 998244353$ satisfying $y \equiv xz \pmod{998244353}$, so output z.

Input

The input is given from Standard Input in the following format:

N
$r_1\ g_1\ b_1$
$\vdots$
$r_N\ g_N\ b_N$

- $2 \leq N \leq 2 \times 10^3$
- $0 \leq r_i, g_i, b_i \leq 2 \times 10^5$
- All input values are integers.

Output

Print N lines. The i-th line should contain the answer for $k = i$.

Examples

standard input	standard output
3 180 0 0 0 180 180 0 0 180	7200 5400 800
6 30594 32322 46262 63608 59020 98436 90150 32740 67209 82886 4627 54813 3112 67989 74995 60872 9967 9051	715162883 838096208 930330061 405079896 880764907 526006962

Note

In the first example, for $k = 2$, mixing the second and third colors produces a color with extended RGB values of $(0, 90, 180)$. The vividness of this color is $\frac{(0-90)^2+(90-90)^2+(180-90)^2}{3} = 5400$.

Problem M. Do Not Turn Back

Time limit: 4 seconds
Memory limit: 1024 megabytes

You are given a simple connected undirected graph G with N vertices numbered from 1 to N and M edges numbered from 1 to M. Each edge $1 \le i \le M$ connects vertices u_i and v_i.

You are given a positive integer K, and you need to find the number of walks of length K from vertex 1 to vertex N such that no edge is used consecutively.

More formally, find the number of sequences $a = (a_0, a_1, \ldots, a_K)$ of length $K + 1$ that satisfy all of the following conditions:

- a_i is an integer between 1 and N for all $0 \le i \le K$.
- $a_0 = 1$ and $a_K = N$.
- There is an edge directly connecting a_{i-1} and a_i in G for all $1 \le i \le K$.
- $a_{i-2} \ne a_i$ for all $2 \le i \le K$.

Calculate the number of such sequences and output the answer modulo 998244353.

Input

The input is given from Standard Input in the following format:

N M K
u_1 v_1
u_2 v_2
$\vdots$
u_M v_M

- $1 \le N \le 100$
- $N - 1 \le M \le \dfrac{N(N-1)}{2}$
- $1 \le K \le 10^9$
- $1 \le u_i < v_i \le N (1 \le i \le M)$
- G is a simple connected undirected graph.
- All input values are integers.

Output

Print the answer in a single line.

Examples

standard input	standard output
6 8 5 1 2 1 3 2 3 2 4 3 5 4 5 4 6 5 6	2
11 11 2023 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9 10 10 11 1 11	1
7 21 1000000000 1 2 1 3 1 4 1 5 1 6 1 7 2 3 2 4 2 5 2 6 2 7 3 4 3 5 3 6 3 7 4 5 4 6 4 7 5 6 5 7 6 7	405422475

Note

In the first example, $1 \to 2 \to 3 \to 5 \to 4 \to 6$ and $1 \to 3 \to 2 \to 4 \to 5 \to 6$ both satisfy the conditions.

Problem N. 0100 Insertion

Time limit: 2 seconds
Memory limit: 1024 megabytes

A string T is called a **good string** if it can be obtained by performing the following operation repeatedly to an initially empty string T :

- Insert the substring `0100` at any position in T.

You are given a string S of length N consisting of `0`, `1`, and `?`. Count the number of good strings that can be obtained by replacing each `?` in S with either `0` or `1`. Output the answer modulo 998244353.

Input

The input is given from Standard Input in the following format:

N
S

- $4 \leq N \leq 500$
- N is a multiple of 4.
- S is a string of length N consisting of `0`, `1`, and `?`.

Output

Print the answer in a single line.

Examples

standard input	standard output
8 0??0?100	2
4 ?10?	1
28 ??????????0???0??????1???0?	2023

Note

In the first example, the good strings that can be obtained by replacing each `?` in S are `00100100` and `01000100`.

Problem O. Sub Brackets

Time limit: 2 seconds
Memory limit: 1024 megabytes

Let us define a correct parenthesis sequence as a string that satisfies one of the following conditions.

- It is an empty string.
- It is a concatenation of `(`, s, and `)` in this order, for some correct parenthesis sequence s.
- It is a concatenation of s and t in this order, for some non-empty correct parenthesis sequences s and t.

Consider a string S of length N consisting of the characters `(` and `)`.

What is the maximum number of the following M conditions that can be satisfied simultaneously?

- condition i : The contiguous substring from the L_i-th through the R_i-th character of S is a correct parenthesis sequence.

Input

The input is given from Standard Input in the following format:

N M
L_1 R_1
$\vdots$
L_M R_M

- $2 \leq N \leq 500$
- $1 \leq M \leq 500$
- $1 \leq L_i < R_i \leq N$
- $R_i - L_i + 1$ is even.
- All input values are integers.

Output

Print the answer in a single line.

Examples

standard input	standard output
5 3 1 2 4 5 2 5	2
2 4 1 2 1 2 1 2 1 2	4
32 11 25 32 19 32 11 24 20 31 22 25 21 26 17 22 30 31 23 28 4 15 19 22	8

Note

In the first example, for $S =$ `(()()`, the first condition is not satisfied, but the second and third conditions are satisfied. It is not possible to satisfy all three conditions simultaneously; therefore, the answer is 2.