A - Leftrightarrow

Time Limit: 2 sec / Memory Limit: 1024 MB

Scoring: 100 points

Problem Statement

You are given a string S consisting of `<`, `=`, and `>`.

Determine whether S is a **bidirectional arrow** string.

A string S is a bidirectional arrow string if and only if there is a positive integer k such that S is a concatenation of one `<`, k `=`s, and one `>`, in this order, with a length of $(k+2)$.

Constraints

- S is a string of length between 3 and 100, inclusive, consisting of `<`, `=`, and `>`.

Input

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

$$S$$

Output

If S is a **bidirectional arrow** string, print `Yes`; otherwise, print `No`.

Sample Input 1

```
<====>
```

Sample Output 1

```
Yes
```

`<====>` is a concatenation of one `<`, four `=`s, and one `>`, in this order, so it is a bidirectional arrow string.

Hence, print `Yes`.

Sample Input 2

```
==>
```

Sample Output 2

```
No
```

`==>` does not meet the condition for a bidirectional arrow string.

Hence, print `No`.

Sample Input 3

```
<>>
```

Sample Output 3

```
No
```

B - Integer Division Returns

Time Limit: 2 sec / Memory Limit: 1024 MB

Score: 200 points

Problem Statement

Given an integer X between -10^{18} and 10^{18}, inclusive, print $\left\lceil \dfrac{X}{10} \right\rceil$.

Here, $\lceil a \rceil$ denotes the smallest integer not less than a.

Constraints

- $-10^{18} \leq X \leq 10^{18}$
- X is an integer.

Input

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

X

Output

Print $\left\lceil \dfrac{X}{10} \right\rceil$ as an integer.

Sample Input 1

```
27
```

Sample Output 1

```
3
```

The integers not less than $\frac{27}{10} = 2.7$ are $3, 4, 5, \dots$. Among these, the smallest is 3, so $\left\lceil \frac{27}{10} \right\rceil = 3$.

Sample Input 2

```
-13
```

Sample Output 2

```
-1
```

The integers not less than $\frac{-13}{10} = -1.3$ are all positive integers, 0, and -1. Among these, the smallest is -1, so $\left\lceil \frac{-13}{10} \right\rceil = -1$.

Sample Input 3

```
40
```

Sample Output 3

```
4
```

The smallest integer not less than $\frac{40}{10} = 4$ is 4 itself.

Sample Input 4

```
-20
```

Sample Output 4

```
-2
```

Sample Input 5

```
123456789123456789
```

Sample Output 5

```
12345678912345679
```

C - One Time Swap

Time Limit: 2 sec / Memory Limit: 1024 MB

Points: 350 points

Problem Statement

You are given a string S. Find the number of strings that can result from performing the following operation **exactly once**.

- Let N be the length of S. Choose a pair of integers (i, j) such that $1 \leq i < j \leq N$ and swap the i-th and j-th characters of S.

It can be proved that you can always perform it under the constraints of this problem.

Constraints

- S is a string of length between 2 and 10^6, inclusive, consisting of lowercase English letters.

Input

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

```
S
```

Output

Print the number of strings that can result from performing the operation in the problem statement exactly once on S.

Sample Input 1

```
abc
```

Sample Output 1

```
3
```

The length of S is 3, so $1 \leq i < j \leq 3$ is satisfied by three pairs of integers (i, j): $(1, 2)$, $(1, 3)$, and $(2, 3)$.

- Swapping the 1-st and 2-nd characters of S results in S being `bac`.
- Swapping the 1-st and 3-rd characters of S results in S being `cba`.
- Swapping the 2-nd and 3-rd characters of S results in S being `acb`.

Therefore, the operation on `abc` results in one of the three strings: `bac`, `cba`, and `acb`, so print 3.

Sample Input 2

```
aaaaa
```

Sample Output 2

```
1
```

Swapping any two characters results in S remaining `aaaaa`. Thus, only one string can result from the operation.

D - Tiling

Time Limit: 2 sec / Memory Limit: 1024 MB

Score: 450 points

Problem Statement

There is a grid of H rows and W columns, each cell having a side length of 1, and we have N tiles.
The i-th tile ($1 \leq i \leq N$) is a rectangle of size $A_i \times B_i$.
Determine whether it is possible to place the tiles on the grid so that all of the following conditions are satisfied:

- Every cell is covered by exactly one tile.
- It is fine to have unused tiles.
- The tiles **may be rotated or flipped when placed**. However, each tile must be aligned with the edges of the cells without extending outside the grid.

Constraints

- $1 \leq N \leq 7$
- $1 \leq H,W \leq 10$
- $1 \leq A_i,B_i \leq 10$
- All input values are integers.

Input

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

$$
\begin{array}{l}
N \quad H \quad W \\
A_1 \quad B_1 \\
A_2 \quad B_2 \\
\ldots \\
A_N \quad B_N
\end{array}
$$

Output

If it is possible to place the tiles on the grid so that all of the conditions in the problem statement are satisfied, print `Yes`; otherwise, print `No`.

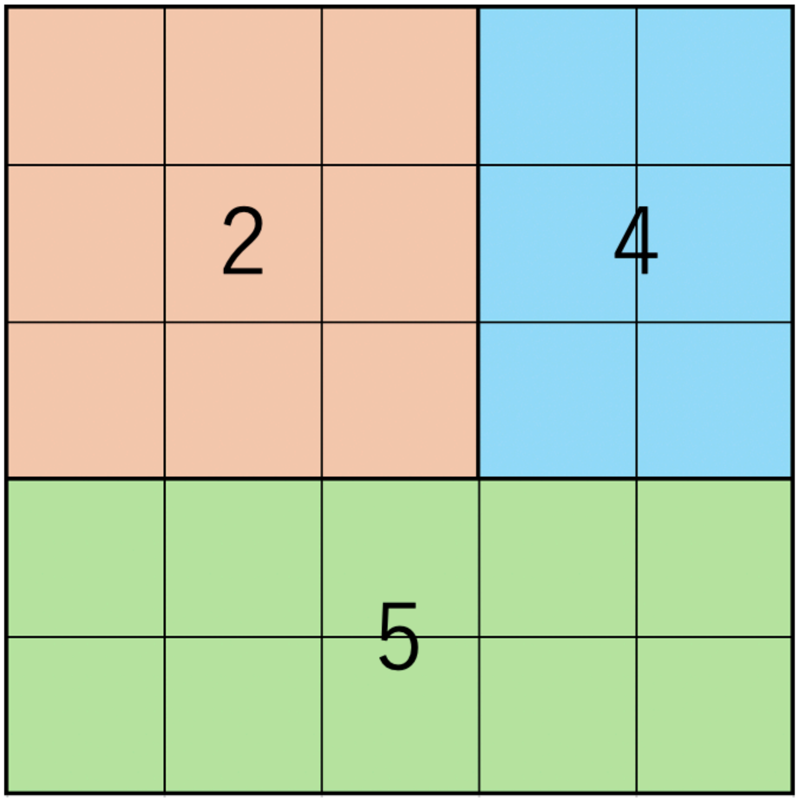
Sample Input 1

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

Sample Output 1

```
Yes
```

Placing the 2-nd, 4-th, and 5-th tiles as shown below covers every cell of the grid by exactly one tile.



Hence, print `Yes`.

Sample Input 2

```
1 1 2
2 3
```

Sample Output 2

```
No
```

It is impossible to place the tile without letting it extend outside the grid.

Hence, print `No`.

Sample Input 3

```
1 2 2
1 1
```

Sample Output 3

```
No
```

It is impossible to cover all cells with the tile.

Hence, print `No`.

Sample Input 4

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

Sample Output 4

```
No
```

Note that each cell must be covered by exactly one tile.

E - Colorful Subsequence

Time Limit: 5 sec / Memory Limit: 1024 MB

Score: 525 points

Problem Statement

There are N balls lined up in a row.
The i-th ball from the left is of color C_i and has a value of V_i.

Takahashi wants to remove **exactly** K balls from this row so that no two adjacent balls have the same color when arranging the remaining balls without changing the order. Additionally, under that condition, he wants to maximize the total value of the balls remaining in the row.

Determine if Takahashi can remove K balls so that no two adjacent balls in the remaining row have the same color. If it is possible, find the maximum possible total value of the remaining balls.

Constraints

- $1 \leq K < N \leq 2 \times 10^5$
- $K \leq 500$
- $1 \leq C_i \leq N$
- $1 \leq V_i \leq 10^9$
- All input values are integers.

Input

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

$$
\begin{array}{l}
N \quad K \\
C_1 \quad V_1 \\
C_2 \quad V_2 \\
\vdots \\
C_N \quad V_N
\end{array}
$$

Output

If Takahashi can remove K balls so that no two adjacent balls in the remaining row have the same color, print the maximum possible total value of the remaining balls as an integer. Otherwise, print -1.

Sample Input 1

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

Sample Output 1

```
10
```

After removing the 3-rd and 5-th balls from the left, the remaining balls are of colors $1, 3, 1$ from left to right, so no two adjacent balls have the same color, satisfying the condition.
The total value of the remaining balls is $V_1 + V_2 + V_4 = 1 + 5 + 4 = 10$.
There are other ways to remove two balls from the five balls so that no two adjacent balls have the same color, but the total value of the remaining balls is maximized when removing the 3-rd and 5-th balls.

Hence, print 10.

Sample Input 2

```
3 1
1 10
1 10
1 10
```

Sample Output 2

```
-1
```

No matter how you remove one ball, balls of color 1 will end up next to each other.

Hence, print -1.

Sample Input 3

```
3 1
1 1
2 2
3 3
```

Sample Output 3

```
5
```

Note that exactly K balls must be removed.

F - Many Lamps

Time Limit: 2 sec / Memory Limit: 1024 MB

Score: 550 points

Problem Statement

There is a simple graph with N vertices numbered 1 to N and M edges numbered 1 to M. Edge i connects vertices u_i and v_i.
Each vertex has one lamp on it. Initially, all the lamps are off.

Determine whether it is possible to turn exactly K lamps on by performing the following operation between 0 and M times, inclusive.

- Choose one edge. Let u and v be the endpoints of the edge. Toggle the states of the lamps on u and v. That is, if the lamp is on, turn it off, and vice versa.

If it is possible to turn exactly K lamps on, print a sequence of operations that achieves this state.

Constraints

- $1 \leq N \leq 2 \times 10^5$
- $0 \leq M \leq \min\left(2 \times 10^5, \frac{N(N-1)}{2}\right)$
- $0 \leq K \leq N$
- $1 \leq u_i < v_i \leq N$
- The given graph is simple.
- All input values are integers.

Input

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

$$
\begin{array}{ll}
N & M \quad K \\
u_1 & v_1 \\
u_2 & v_2 \\
\vdots & \\
u_M & v_M
\end{array}
$$

Output

If it is impossible to turn exactly K lamps on, print `No`.

Otherwise, first print `Yes`, and then print a sequence of operations in the following format:

$$
\begin{array}{l}
X \\
e_1 \quad e_2 \quad \ldots \quad e_X
\end{array}
$$

Here, X is the number of operations, and e_i is the number of the edge chosen in the i-th operation. These must satisfy the following:

- $0 \leq X \leq M$
- $1 \leq e_i \leq M$

If multiple sequences of operations satisfy the conditions, any of them will be considered correct.

Sample Input 1

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

Sample Output 1

```
Yes
3
3 4 5
```

If we operate according to the sample output, it will go as follows:

- Choose edge 3. Turn on the lamps on vertex 2 and vertex 4.
- Choose edge 4. Turn on the lamps on vertex 3 and vertex 5.
- Choose edge 5. Turn on the lamp on vertex 1 and turn off the lamp on vertex 5.

After completing all operations, the lamps on vertices $1, 2, 3$, and 4 are on. Therefore, this sequence of operations satisfies the conditions.

Other possible sequences of operations that satisfy the conditions include $X = 4, (e_1, e_2, e_3, e_4) = (3, 4, 3, 1)$. (It is allowed to choose the same edge more than once.)

Sample Input 2

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

Sample Output 2

```
No
```

Sample Input 3

```
10 10 6
2 5
2 6
3 5
3 8
4 6
4 8
5 9
6 7
6 10
7 9
```

Sample Output 3

```
Yes
3
10 9 6
```

G - Sugoroku 5

Time Limit: 12 sec / Memory Limit: 1024 MB

Score: 675 points

Problem Statement

There is a board game with $N+1$ squares: square 0, square $1, \dots$, square N.
You have a die (dice) that rolls an integer between 1 and K, inclusive, with equal probability for each outcome.
You start on square 0. You repeat the following operation until you reach square N:

- Roll the dice. Let x be the current square and y be the rolled number, then move to square $\min(N, x+y)$.

Let P_i be the probability of reaching square N after exactly i operations. Calculate $P_1, P_2, \dots, P_N$ modulo 998244353.

▶ What is probability modulo 998244353?

Constraints

- $1 \leq K \leq N \leq 2 \times 10^5$
- N and K are integers.

Input

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

$$N \quad K$$

Output

Print N lines. The i-th line should contain P_i modulo 998244353.

Sample Input 1

```
3 2
```

Sample Output 1

```
0
249561089
748683265
```

For example, you reach square N after exactly two operations when the die rolls the following numbers:

- A 1 on the first operation, and a 2 on the second operation.
- A 2 on the first operation, and a 1 on the second operation.
- A 2 on the first operation, and a 2 on the second operation.

Therefore, $P_2 = \left(\frac{1}{2} \times \frac{1}{2}\right) \times 3 = \frac{3}{4}$. We have $249561089 \times 4 \equiv 3 \pmod{998244353}$, so print 249561089 for P_2.

Sample Input 2

```
5 5
```

Sample Output 2

```
598946612
479157290
463185380
682000542
771443236
```

Sample Input 3

```
10 6
```

Sample Output 3

```
0
166374059
207967574
610038216
177927813
630578223
902091444
412046453
481340945
404612686
```