A - Full House 2

Time Limit: 2 sec / Memory Limit: 1024 MiB

Score : 100 points

Problem Statement

There are four cards with integers A, B, C, D written on them.
Determine whether a Full House can be formed by adding one card.

A set of five cards is called a Full House if and only if the following condition is satisfied:

- For two distinct integers x and y, there are three cards with x written on them and two cards with y written on them.

Constraints

- All input values are integers.
- $1 \leq A, B, C, D \leq 13$

Input

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

```
A B C D
```

Output

If adding one card can form a Full House, print `Yes`; otherwise, print `No`.

Sample Input 1

```
7 7 7 1
```

Sample Output 1

```
Yes
```

Adding 1 to $7, 7, 7, 1$ forms a Full House.

Sample Input 2

```
13 12 11 10
```

Sample Output 2

```
No
```

Adding anything to $13, 12, 11, 10$ does not form a Full House.

Sample Input 3

```
3 3 5 5
```

Sample Output 3

```
Yes
```

Adding $3, 3, 5, 5$ to 3 forms a Full House.
Also, adding 5 forms a Full House.

Sample Input 4

```
8 8 8 8
```

Sample Output 4

```
No
```

Adding anything to $8, 8, 8, 8$ does not form a Full House.
Note that five identical cards do not form a Full House.

Sample Input 5

```
1 3 4 1
```

Sample Output 5

```
No
```

B - Calculator

Time Limit: 2 sec / Memory Limit: 1024 MiB

Score : 200 points

Problem Statement

There is a calculator with the buttons `00`, `0`, 1, 2, 3, 4, 5, 6, 7, 8, 9.

When a string x is displayed on this calculator and you press a button b, the resulting displayed string becomes the string x with b appended to its end.

Initially, the calculator displays the empty string (a string of length 0).

Find the minimum number of button presses required to display the string S on this calculator.

Constraints

- S is a string of length at least 1 and at most 1000, consisting of `0`, 1, 2, 3, 4, 5, 6, 7, 8, 9.
- The first character of S is not `0`.

Input

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

```
S
```

Output

Print the answer as an integer.

Sample Input 1

```
1000000007
```

Sample Output 1

```
6
```

To display `1000000007`, you can press the buttons `1`, `00`, `00`, `00`, `00`, `7` in this order. The total number of button presses is 6, and this is the minimum possible.

Sample Input 2

```
998244353
```

Sample Output 2

```
9
```

Sample Input 3

```
32000
```

Sample Output 3

```
4
```

C - Operate 1

Time Limit: 2 sec / Memory Limit: 1024 MiB

Score : 350 points

Problem Statement

This problem is a sub-problem of Problem F (Operate K), with $K = 1$.

You can solve this problem by submitting a correct solution for Problem F to this problem.

Determine whether it is possible to perform the following operation on string S between 0 and K times, inclusive, to make it identical to string T.

- Choose one of the following three operations and execute it.
  - Insert any one character at any position in S (possibly the beginning or end).
  - Delete one character from S.
  - Choose one character in S and replace it with another character.

Constraints

- Each of S and T is a string of length between 1 and 500000, inclusive, consisting of lowercase English letters.
- $K = 1$

Input

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

```
K
S
T
```

Output

If S can be made identical to T with at most K operations, print `Yes`; otherwise, print `No`.

Sample Input 1

```
1
abc
agc
```

Sample Output 1

```
Yes
```

Replacing the second character `b` of `abc` with `g` converts `abc` to `agc` in one operation.

Sample Input 2

```
1
abc
awtf
```

Sample Output 2

```
No
```

`abc` cannot be converted to `awtf` in one operation.

Sample Input 3

```
1
abc
ac
```

Sample Output 3

```
Yes
```

Deleting the second character `b` of `abc` converts `abc` to `ac` in one operation.

Sample Input 4

```
1
back
black
```

Sample Output 4

```
Yes
```

Inserting `l` between the first and second characters of `back` converts `back` to `black` in one operation.

Sample Input 5

```
1
same
same
```

Sample Output 5

```
Yes
```

It is also possible that $S = T$ from the beginning.

Sample Input 6

```
1
leap
read
```

Sample Output 6

```
No
```

D - Diagonal Separation

Time Limit: 2 sec / Memory Limit: 1024 MiB

Score : 425 points

Problem Statement

There is an $N \times N$ grid. Takahashi wants to color each cell black or white so that all of the following conditions are satisfied:

- For every row, the following condition holds:
  - There exists an integer i $(0 \leq i \leq N)$ such that the leftmost i cells are colored black, and the rest are colored white.
- For every column, the following condition holds:
  - There exists an integer i $(0 \leq i \leq N)$ such that the topmost i cells are colored black, and the rest are colored white.

Out of these N^2 cells, M of them have already been colored. Among them, the i-th one is at the X_i-th row from the top and the Y_i-th column from the left, and it is colored black if C_i is `B` and white if C_i is `W`.

Determine whether he can color the remaining uncolored $N^2 - M$ cells so that all the conditions are satisfied.

Constraints

- $1 \leq N \leq 10^9$
- $1 \leq M \leq \min(N^2, 2 \times 10^5)$
- $1 \leq X_i, Y_i \leq N$
- $(X_i, Y_i) \neq (X_j, Y_j)$ $(i \neq j)$
- C_i is `B` or `W`.
- All input numbers are integers.

Input

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

$$
\begin{aligned}
&N \quad M \\
&X_1 \quad Y_1 \quad C_1 \\
&\vdots \\
&X_M \quad Y_M \quad C_M
\end{aligned}
$$

Output

If it is possible to satisfy the conditions, print `Yes`; otherwise, print `No`.

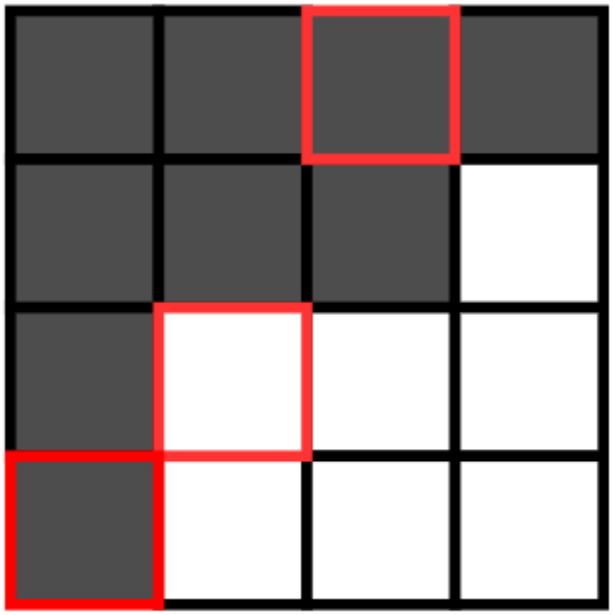
Sample Input 1

```
4 3
4 1 B
3 2 W
1 3 B
```

Sample Output 1

```
Yes
```

For example, one can color the grid as in the following figure to satisfy the conditions. The cells already colored are surrounded by red borders.



Sample Input 2

```
2 2
1 2 W
2 2 B
```

Sample Output 2

```
No
```

No matter how the remaining two cells are colored, the conditions cannot be satisfied.

Sample Input 3

```
1 1
1 1 W
```

Sample Output 3

```
Yes
```

Sample Input 4

```
2289 10
1700 1083 W
528 967 B
1789 211 W
518 1708 W
1036 779 B
136 657 B
759 1497 B
902 1309 B
1814 712 B
936 763 B
```

Sample Output 4

```
No
```

E - Maximize XOR

Time Limit: 2 sec / Memory Limit: 1024 MiB

Score : 500 points

Problem Statement

You are given a sequence A of non-negative integers of length N, and an integer K. It is guaranteed that the binomial coefficient $\binom{N}{K}$ is at most 10^6.

When choosing K distinct elements from A, find the maximum possible value of the XOR of the K chosen elements.

That is, find $\max_{1 \leq i_1 < i_2 < \ldots < i_K \leq N} A_{i_1} \oplus A_{i_2} \oplus \ldots \oplus A_{i_K}$.

▶ About XOR

Constraints

- $1 \leq K \leq N \leq 2 \times 10^5$
- $0 \leq A_i < 2^{60}$
- $\binom{N}{K} \leq 10^6$
- All input values are integers.

Input

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

N K
A_1 A_2 $\ldots$ A_N

Output

Print the answer.

Sample Input 1

```
4 2
3 2 6 4
```

Sample Output 1

```
7
```

Here are six ways to choose two distinct elements from $(3, 2, 6, 4)$.

- $(3, 2)$: The XOR is $3 \oplus 2 = 1$.
- $(3, 6)$: The XOR is $3 \oplus 6 = 5$.
- $(3, 4)$: The XOR is $3 \oplus 4 = 7$.
- $(2, 6)$: The XOR is $2 \oplus 6 = 4$.
- $(2, 4)$: The XOR is $2 \oplus 4 = 6$.
- $(6, 4)$: The XOR is $6 \oplus 4 = 2$.

Hence, the maximum possible value is 7.

Sample Input 2

```
10 4
1516 1184 1361 2014 1013 1361 1624 1127 1117 1759
```

Sample Output 2

```
2024
```

F - Operate K

Time Limit: 2 sec / Memory Limit: 1024 MiB

Score : 525 points

Problem Statement

This problem fully contains Problem C (Operate 1), with $K \leq 20$.

You can solve Problem C by submitting a correct solution to this problem for Problem C.

Determine whether it is possible to perform the following operation on string S between 0 and K times, inclusive, to make it identical to string T.

- Choose one of the following three operations and execute it.
  - Insert any one character at any position in S (possibly the beginning or end).
  - Delete one character from S.
  - Choose one character in S and replace it with another character.

Constraints

- Each of S and T is a string of length between 1 and 500000, inclusive, consisting of lowercase English letters.
- K is an integer satisfying $1 \leq K \leq 20$.

Input

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

K
S
T

Output

If S can be made identical to T with at most K operations, print `Yes`; otherwise, print `No`.

Sample Input 1

```
3
abc
awtf
```

Sample Output 1

```
Yes
```

For example, here is a way to convert `abc` to `awtf` with three operations:

- Replace the second character `b` with `w`. After the operation, the string becomes `awc`.
- Replace the third character `c` with `f`. After the operation, the string becomes `awf`.
- Insert `t` between the second and third characters. After the operation, the string becomes `awtf`.

Sample Input 2

```
2
abc
awtf
```

Sample Output 2

```
No
```

`abc` cannot be converted to `awtf` with two or fewer operations.

Sample Input 3

```
17
twothousandtwentyfour
happynewyear
```

Sample Output 3

```
Yes
```

G - Many MST

Time Limit: 4 sec / Memory Limit: 1024 MiB

Score : 600 points

Problem Statement

You are given positive integers N and M. Consider a weighted complete graph with N vertices labeled from 1 to N, where the weight of each edge is an integer between 1 and M, inclusive. There are $M^{N(N-1)/2}$ such graphs. For each of them, consider the sum of the weights of the edges included in its Minimum Spanning Tree. What is the total of these sums? Print the result modulo 998244353.

Constraints

- $2 \leq N \leq 500$
- $1 \leq M \leq 500$
- All input values are integers.

Input

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

N M

Output

Print the answer.

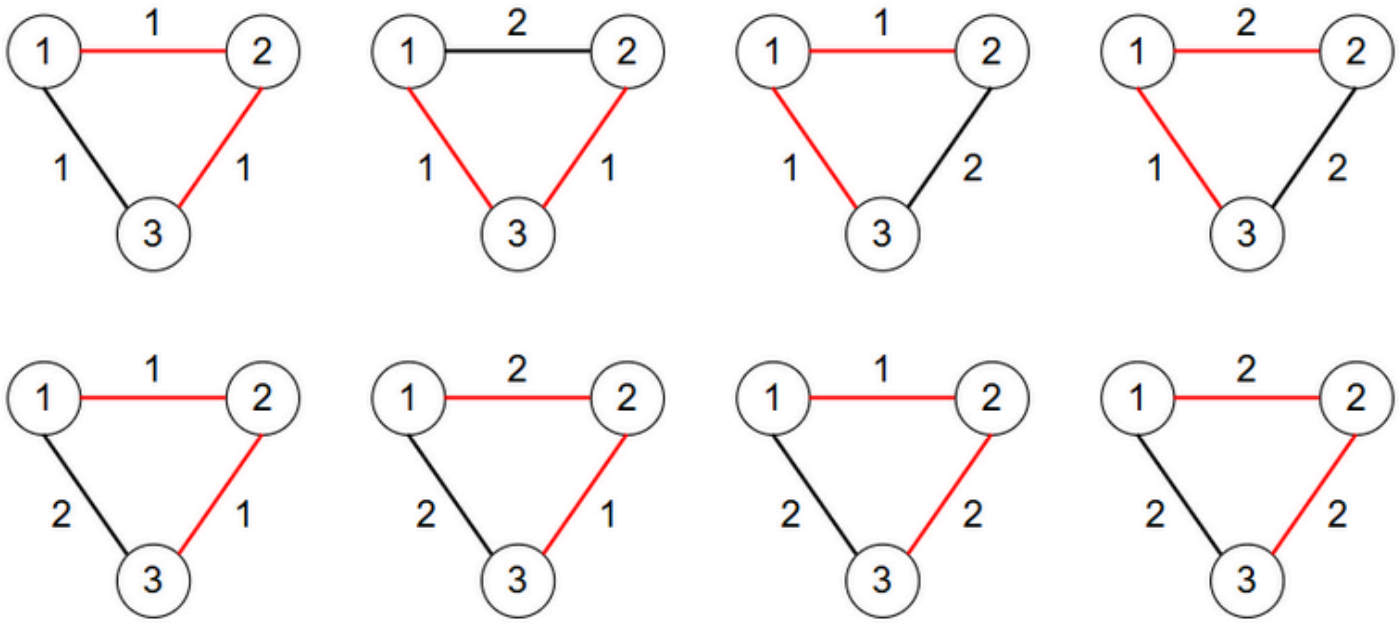
Sample Input 1

```
3 2
```

Sample Output 1

```
21
```

Here are eight complete graphs with three vertices where edge weights are 1 or 2. The edges in each graph's MST are highlighted in red in the figure below.



The sums of the MST edges for these graphs are $2, 2, 2, 3, 2, 3, 3, 4$, so the total is $2 + 2 + 2 + 3 + 2 + 3 + 3 + 4 = 21$.

Sample Input 2

```
2 100
```

Sample Output 2

```
5050
```

Sample Input 3

```
20 24
```

Sample Output 3

```
707081320
```