A - Triple Four

Time Limit: 2 sec / Memory Limit: 1024 MiB

Score : 100 points

Problem Statement

You are given an integer sequence of length N: $A = (A_1, A_2, \ldots, A_N)$.

Determine whether there is a place in A where the same element appears three or more times in a row.

More formally, determine whether there exists an integer i with $1 \leq i \leq N-2$ such that $A_i = A_{i+1} = A_{i+2}$.

Constraints

- $3 \leq N \leq 100$
- $1 \leq A_i \leq 100$
- All input values are integers.

Input

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

N
$A_1 \quad A_2 \quad \ldots \quad A_N$

Output

If there is a place in A where the same element appears three or more times in a row, print `Yes`. Otherwise, print `No`.

Sample Input 1

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

Sample Output 1

```
Yes
```

We have $A = (1, 4, 4, 4, 2)$. There is a place where 4 appears three times in a row, so print `Yes`.

Sample Input 2

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

Sample Output 2

```
No
```

We have $A = (2, 4, 4, 2, 2, 4)$. There is no place where the same element appears three or more times in a row, so print `No`.

Sample Input 3

```
8
1 4 2 5 7 7 7 2
```

Sample Output 3

```
Yes
```

Sample Input 4

```
10
1 2 3 4 5 6 7 8 9 10
```

Sample Output 4

```
No
```

Sample Input 5

```
13
1 1 1 1 1 1 1 1 1 1 1 1 1
```

Sample Output 5

```
Yes
```

B - Card Pile

Time Limit: 2 sec / Memory Limit: 1024 MiB

Score : 200 points

Problem Statement

There is a stack of 100 cards, each labeled with the integer 0.

Process Q queries. Each query is of one of the following:

- Type 1: Place a card labeled with an integer x on top of the stack.
- Type 2: Remove the top card of the stack and output the integer written on that removed card. Under the constraints of this problem, the stack always has at least one card.

Constraints

- $1 \leq Q \leq 100$
- $1 \leq x \leq 100$
- There is at least one query of type 2.
- All input values are integers.

Input

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

$$
\begin{aligned}
&Q\\
&\mathrm{query}_1\\
&\mathrm{query}_2\\
&\vdots\\
&\mathrm{query}_Q
\end{aligned}
$$

The i-th query query_i starts with the query type c_i (1 or 2), followed by the integer x if $c_i = 1$.

That is, each query is in one of the following two formats:

$$1 \quad x$$

$$2$$

Output

Let q be the number of queries with $c_i = 2$. Print q lines.

The j-th line ($1 \leq j \leq q$) should contain the answer to the j-th such query.

Sample Input 1

```
6
2
1 4
1 3
2
2
2
```

Sample Output 1

```
0
3
4
0
```

After processing each query, the stack is as follows:

- Remove the top card of the stack. The integer on the removed card is 0, so output 0.
  - The stack then has 99 cards labeled with 0.
- Add a card labeled 4 on top.
  - The stack then has 1 card labeled 4, and 99 cards labeled 0, from top to bottom.
- Add a card labeled 3 on top.
  - The stack then has 1 card labeled 3, 1 card labeled 4, and 99 cards labeled 0, from top to bottom.
- Remove the top card. The integer on that card is 3, so output 3.
  - The stack then has 1 card labeled 4, and 99 cards labeled 0, from top to bottom.
- Remove the top card. The integer on that card is 4, so output 4.
  - The stack then has 99 cards labeled 0.
- Remove the top card. The integer on that card is 0, so output 0.
  - The stack then has 98 cards labeled 0.

Sample Input 2

```
5
2
2
2
2
2
```

Sample Output 2

```
0
0
0
0
0
```

C - Buy Balls

Time Limit: 2 sec / Memory Limit: 1024 MiB

Score : 300 points

Problem Statement

There are N black balls and M white balls.
Each ball has a value. The value of the i-th black ball ($1 \leq i \leq N$) is B_i, and the value of the j-th white ball ($1 \leq j \leq M$) is W_j.

Choose zero or more balls so that the number of black balls chosen is at least the number of white balls chosen. Among all such choices, find the maximum possible sum of the values of the chosen balls.

Constraints

- $1 \leq N, M \leq 2 \times 10^5$
- $-10^9 \leq B_i, W_j \leq 10^9$
- All input values are integers.

Input

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

$$
\begin{array}{llll}
N & M & & \\
B_1 & B_2 & \ldots & B_N \\
W_1 & W_2 & \ldots & W_M
\end{array}
$$

Output

Print the answer.

Sample Input 1

```
4 3
8 5 -1 3
3 -2 -4
```

Sample Output 1

```
19
```

If you choose the 1st, 2nd, and 4th black balls, and the 1st white ball, the sum of their values is $8 + 5 + 3 + 3 = 19$, which is the maximum.

Sample Input 2

```
4 3
5 -10 -2 -5
8 1 4
```

Sample Output 2

```
15
```

If you choose the 1st and 3rd black balls, and the 1st and 3rd white balls, the sum of their values is $5 + (-2) + 8 + 4 = 15$, which is the maximum.

Sample Input 3

```
3 5
-36 -33 -31
12 12 28 24 27
```

Sample Output 3

```
0
```

It is possible to choose no balls.

D - Minimum XOR Path

Time Limit: 2 sec / Memory Limit: 1024 MiB

Score : 400 points

Problem Statement

You are given a simple connected undirected graph with N vertices numbered 1 through N and M edges numbered 1 through M. Edge i connects vertices u_i and v_i, and has a label w_i.

Among all simple paths (paths that do not pass through the same vertex more than once) from vertex 1 to vertex N, find the minimum XOR of the labels of the edges on the path.

▶ Notes on XOR

Constraints

- $2 \leq N \leq 10$
- $N-1 \leq M \leq \frac{N(N-1)}{2}$
- $1 \leq u_i < v_i \leq N$
- $0 \leq w_i < 2^{60}$
- The given graph is a simple connected undirected graph.
- All input values are integers.

Input

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

$$
\begin{array}{lll}
N & M & \\
u_1 & v_1 & w_1 \\
u_2 & v_2 & w_2 \\
\vdots & & \\
u_M & v_M & w_M
\end{array}
$$

Output

Print the answer.

Sample Input 1

```
4 4
1 2 3
2 4 5
1 3 4
3 4 7
```

Sample Output 1

```
3
```

There are two simple paths from vertex 1 to vertex 4:

- $1 \to 2 \to 4$
- $1 \to 3 \to 4$

The XOR of the labels on the edges of the first path is 6, and that of the second path is 3. Therefore, the answer is 3.

Sample Input 2

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

Sample Output 2

```
7
```

Sample Input 3

```
7 10
1 2 726259430069220777
1 4 988687862609183408
1 5 298079271598409137
1 6 920499328385871537
1 7 763940148194103497
2 4 382710956291350101
3 4 770341659133285654
3 5 422036395078103425
3 6 472678770470637382
5 7 938201660808593198
```

Sample Output 3

```
186751192333709144
```

E - Min of Restricted Sum

Time Limit: 3 sec / Memory Limit: 1024 MiB

Score : 450 points

Problem Statement

You are given integers N, M and three integer sequences of length M: $X = (X_1, X_2, \ldots, X_M)$, $Y = (Y_1, Y_2, \ldots, Y_M)$, and $Z = (Z_1, Z_2, \ldots, Z_M)$. It is guaranteed that all elements of X and Y are between 1 and N, inclusive.

We call a length-N sequence of non-negative integers $A = (A_1, A_2, \ldots, A_N)$ a **good sequence** if and only if it satisfies the following condition:

- For every integer i with $1 \leq i \leq M$, the XOR of A_{X_i} and A_{Y_i} is Z_i.

Determine whether a good sequence $A = (A_1, A_2, \ldots, A_N)$ exists, and if it exists, find one good sequence that minimizes the sum of its elements $\sum_{i=1}^{N} A_i$.

▶ Notes on XOR

Constraints

- $1 \leq N \leq 2 \times 10^5$
- $0 \leq M \leq 10^5$
- $1 \leq X_i, Y_i \leq N$
- $0 \leq Z_i \leq 10^9$
- All input values are integers.

Input

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

$$
\begin{array}{lll}
N & M & \\
X_1 & Y_1 & Z_1 \\
X_2 & Y_2 & Z_2 \\
\vdots & & \\
X_M & Y_M & Z_M
\end{array}
$$

Output

If no good sequence exists, print -1.

If a good sequence exists, print one good sequence that minimizes the sum of its elements, separated by spaces.

If there are multiple good sequences with the same minimum sum, printing any of them is accepted.

Sample Input 1

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

Sample Output 1

```
0 3 4
```

$A = (0, 3, 4)$ is a good sequence because $A_1 \oplus A_2 = 3$ and $A_1 \oplus A_3 = 4$.

Other good sequences include $A = (1, 2, 5)$ and $A = (7, 4, 3)$, but $A = (0, 3, 4)$ has the smallest sum among all good sequences.

Sample Input 2

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

Sample Output 2

```
-1
```

No good sequence exists, so print -1.

Sample Input 3

```
5 8
4 2 4
2 3 11
3 4 15
4 5 6
3 2 11
3 3 0
3 1 9
3 4 15
```

Sample Output 3

```
0 2 9 6 0
```

F - Rotated Inversions

Time Limit: 2 sec / Memory Limit: 1024 MiB

Score : 500 points

Problem Statement

You are given integers N, M and a length-N sequence of non-negative integers $A = (A_1, A_2, \ldots, A_N)$.

For $k = 0, 1, \ldots, M-1$, solve the following problem:

> Define an integer sequence $B = (B_1, B_2, \ldots, B_N)$ so that B_i is the remainder of $A_i + k$ when divided by M. Find the inversion number in B.

▶ What is the inversion number?

Constraints

- $1 \leq N, M \leq 2 \times 10^5$
- $0 \leq A_i < M$
- All input values are integers.

Input

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

N M
A_1 A_2 $\ldots$ A_N

Output

Print M lines.

The i-th line $(1 \leq i \leq M)$ should contain the answer for the case $k = i - 1$.

Sample Input 1

```
3 3
2 1 0
```

Sample Output 1

```
3
1
1
```

- For $k = 0$: $B = (2, 1, 0)$. The inversion number is 3.
- For $k = 1$: $B = (0, 2, 1)$. The inversion number is 1.
- For $k = 2$: $B = (1, 0, 2)$. The inversion number is 1.

Sample Input 2

```
5 6
5 3 5 0 1
```

Sample Output 2

```
7
3
3
1
1
5
```

Sample Input 3

```
7 7
0 1 2 3 4 5 6
```

Sample Output 3

```
0
6
10
12
12
10
6
```

G - Flip Row or Col

Time Limit: 2 sec / Memory Limit: 1024 MiB

Score : 600 points

Problem Statement

There is a $H \times W$ grid, and each cell contains 0 or 1. The cell at the i-th row from the top and the j-th column from the left contains an integer $A_{i,j}$.

You can perform the following two operations any number of times in any order:

- Operation X: Choose an integer x ($1 \leq x \leq H$). For every integer $1 \leq y \leq W$, replace $A_{x,y}$ with $1 - A_{x,y}$.
- Operation Y: Choose an integer y ($1 \leq y \leq W$). For every integer $1 \leq x \leq H$, replace $A_{x,y}$ with $1 - A_{x,y}$.

Find the minimum possible value of $\sum_{x=1}^{H} \sum_{y=1}^{W} A_{x,y}$ after the process.

Constraints

- $1 \leq H \leq 2 \times 10^5$
- $1 \leq W \leq 18$
- H and W are integers.
- $A_{i,1}A_{i,2}\ldots A_{i,W}$ is a length-W string consisting of `0` and `1`.

Input

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

H W
$A_{1,1}A_{1,2}\ldots A_{1,W}$
$A_{2,1}A_{2,2}\ldots A_{2,W}$
$\vdots$
$A_{H,1}A_{H,2}\ldots A_{H,W}$

Output

Print the answer.

Sample Input 1

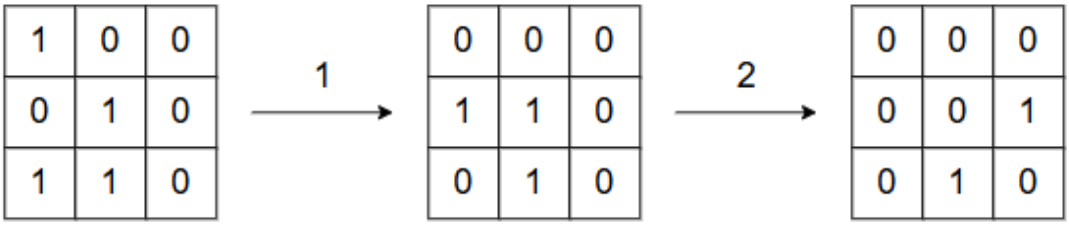
```
3 3
100
010
110
```

Sample Output 1

```
2
```

By performing the following operations, the grid changes as shown below, and you get $\sum_{x=1}^{H}\sum_{y=1}^{W} A_{x,y} = 2$.

1. Operation Y with $y = 1$
2. Operation X with $x = 2$



It is impossible to make $\sum_{x=1}^{H}\sum_{y=1}^{W} A_{x,y} \leq 1$, so the answer is 2.

Sample Input 2

```
3 4
1111
1111
1111
```

Sample Output 2

```
0
```

Sample Input 3

```
10 5
10000
00111
11000
01000
10110
01110
10101
00100
00100
10001
```

Sample Output 3

```
13
```