A - Weather Prediction

Time Limit: 2 sec / Memory Limit: 1024 MB

Score: 100 points

Problem Statement

The weather in Takahashi's town changes day by day, in the following cycle: Sunny, Cloudy, Rainy, Sunny, Cloudy, Rainy, ...

Given is a string S representing the weather in the town today. Predict the weather tomorrow.

Constraints

- S is `'Sunny'`, `'Cloudy'`, or `'Rainy'`.

Input

Input is given from Standard Input in the following format:

```
S
```

Output

Print a string representing the expected weather tomorrow, in the same format in which input is given.

Sample Input 1

```
Sunny
```

Sample Output 1

```
Cloudy
```

In Takahashi's town, a sunny day is followed by a cloudy day.

Sample Input 2

```
Rainy
```

Sample Output 2

```
Sunny
```

B - Tap Dance

Time Limit: 2 sec / Memory Limit: 1024 MB

Score: 200 points

Problem Statement

Takahashi will do a tap dance. The dance is described by a string S where each character is `'L'`, `'R'`, `'U'`, or `'D'`. These characters indicate the positions on which Takahashi should step. He will follow these instructions one by one in order, starting with the first character.

S is said to be *easily playable* if and only if it satisfies both of the following conditions:

- Every character in an odd position (1-st, 3-rd, 5-th, . . .) is `'R'`, `'U'`, or `'D'`.
- Every character in an even position (2-nd, 4-th, 6-th, . . .) is `'L'`, `'U'`, or `'D'`.

Your task is to print `'Yes'` if S is easily playable, and `'No'` otherwise.

Constraints

- S is a string of length between 1 and 100 (inclusive).
- Each character of S is `'L'`, `'R'`, `'U'`, or `'D'`.

Input

Input is given from Standard Input in the following format:

```
S
```

Output

Print `'Yes'` if S is easily playable, and `'No'` otherwise.

Sample Input 1

```
RUDLUDR
```

Sample Output 1

```
Yes
```

Every character in an odd position (1-st, 3-rd, 5-th, 7-th) is `'R'`, `'U'`, or `'D'`.

Every character in an even position (2-nd, 4-th, 6-th) is `'L'`, `'U'`, or `'D'`.

Thus, S is easily playable.

Sample Input 2

```
DULL
```

Sample Output 2

```
No
```

The 3-rd character is not `'R'`, `'U'`, nor `'D'`, so S is not easily playable.

Sample Input 3

```
UUUUUUUUUUUUUUU
```

Sample Output 3

```
Yes
```

Sample Input 4

```
ULURU
```

Sample Output 4

```
No
```

Sample Input 5

```
RDULULDURURLRDULRLR
```

Sample Output 5

```
Yes
```

C - Attack Survival

Time Limit: 2 sec / Memory Limit: 1024 MB

Score: 300 points

Problem Statement

Takahashi has decided to hold fastest-finger-fast quiz games. Kizahashi, who is in charge of making the scoreboard, is struggling to write the program that manages the players' scores in a game, which proceeds as follows.

A game is played by N players, numbered 1 to N. At the beginning of a game, each player has K points.

When a player correctly answers a question, each of the other $N-1$ players receives minus one (-1) point. There is no other factor that affects the players' scores.

At the end of a game, the players with 0 points or lower are eliminated, and the remaining players survive.

In the last game, the players gave a total of Q correct answers, the i-th of which was given by Player A_i. For Kizahashi, write a program that determines whether each of the N players survived this game.

Constraints

- All values in input are integers.
- $2 \leq N \leq 10^5$
- $1 \leq K \leq 10^9$
- $1 \leq Q \leq 10^5$
- $1 \leq A_i \leq N\ (1 \leq i \leq Q)$

Input

Input is given from Standard Input in the following format:

N K Q
A_1
A_2
.
.
.
A_Q

Output

Print N lines. The i-th line should contain `Yes` if Player i survived the game, and `No` otherwise.

Sample Input 1

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

Sample Output 1

```
No
No
Yes
No
No
No
```

In the beginning, the players' scores are $(3, 3, 3, 3, 3, 3)$.

- Player 3 correctly answers a question. The players' scores are now $(2, 2, 3, 2, 2, 2)$.
- Player 1 correctly answers a question. The players' scores are now $(2, 1, 2, 1, 1, 1)$.
- Player 3 correctly answers a question. The players' scores are now $(1, 0, 2, 0, 0, 0)$.
- Player 2 correctly answers a question. The players' scores are now $(0, 0, 1, -1, -1, -1)$.

Players 1, 2, 4, 5 and 6, who have 0 points or lower, are eliminated, and Player 3 survives this game.

Sample Input 2

```
6 5 4
3
1
3
2
```

Sample Output 2

```
Yes
Yes
Yes
Yes
Yes
Yes
```

Sample Input 3

```
10 13 15
3
1
4
1
5
9
2
6
5
3
5
8
9
7
9
```

Sample Output 3

```
No
No
No
No
Yes
No
No
No
Yes
No
```

D - Powerful Discount Tickets

Time Limit: 2 sec / Memory Limit: 1024 MB

Score : 400 points

Problem Statement

Takahashi is going to buy N items one by one.

The price of the i-th item he buys is A_i yen (the currency of Japan).

He has M discount tickets, and he can use any number of them when buying an item.

If Y tickets are used when buying an item priced X yen, he can get the item for $\frac{X}{2^Y}$ (rounded down to the nearest integer) yen.

What is the minimum amount of money required to buy all the items?

Constraints

- All values in input are integers.
- $1 \leq N, M \leq 10^5$
- $1 \leq A_i \leq 10^9$

Input

Input is given from Standard Input in the following format:

$$N \quad M$$
$$A_1 \quad A_2 \quad \dots \quad A_N$$

Output

Print the minimum amount of money required to buy all the items.

Sample Input 1

```
3 3
2 13 8
```

Sample Output 1

```
9
```

We can buy all the items for 9 yen, as follows:

- Buy the 1-st item for 2 yen without tickets.
- Buy the 2-nd item for 3 yen with 2 tickets.
- Buy the 3-rd item for 4 yen with 1 ticket.

Sample Input 2

```
4 4
1 9 3 5
```

Sample Output 2

```
6
```

Sample Input 3

```
1 100000
1000000000
```

Sample Output 3

```
0
```

We can buy the item priced 1000000000 yen for 0 yen with 100000 tickets.

Sample Input 4

```
10 1
1000000000 1000000000 1000000000 1000000000 1000000000 1000000000 1000000000 1000000000 100
0000000 1000000000
```

Sample Output 4

```
9500000000
```

E - Who Says a Pun?

Time Limit: 2 sec / Memory Limit: 1024 MB

Score : 500 points

Problem Statement

Given is a string S of length N.

Find the maximum length of a non-empty string that occurs twice or more in S as contiguous substrings without overlapping.

More formally, find the maximum positive integer len such that there exist integers l_1 and l_2 ($1 \leq l_1, l_2 \leq N - len + 1$) that satisfy the following:

- $l_1 + len \leq l_2$
- $S[l_1 + i] = S[l_2 + i] (i = 0, 1, \ldots, len - 1)$

If there is no such integer len, print 0.

Constraints

- $2 \leq N \leq 5 \times 10^3$
- $|S| = N$
- S consists of lowercase English letters.

Input

Input is given from Standard Input in the following format:

N
S

Output

Print the maximum length of a non-empty string that occurs twice or more in S as contiguous substrings without overlapping. If there is no such non-empty string, print 0 instead.

Sample Input 1

```
5
ababa
```

Sample Output 1

```
2
```

The strings satisfying the conditions are: `'a'`, `'b'`, `'ab'`, and `'ba'`. The maximum length among them is 2, which is the answer. Note that `'aba'` occurs twice in S as contiguous substrings, but there is no pair of integers l_1 and l_2 mentioned in the statement such that $l_1 + len \leq l_2$.

Sample Input 2

```
2
xy
```

Sample Output 2

```
0
```

No non-empty string satisfies the conditions.

Sample Input 3

```
13
strangeorange
```

Sample Output 3

```
5
```

F - Xor Sum 3

Time Limit: 2 sec / Memory Limit: 1024 MB

Score: 600 points

Problem Statement

We have N non-negative integers: $A_1, A_2, \ldots, A_N$.

Consider painting at least one and at most $N-1$ integers among them in red, and painting the rest in blue.

Let the *beauty* of the painting be the XOR of the integers painted in red, plus the XOR of the integers painted in blue.

Find the maximum possible beauty of the painting.

▶ What is XOR?

Constraints

- All values in input are integers.
- $2 \leq N \leq 10^5$
- $0 \leq A_i < 2^{60}$ $(1 \leq i \leq N)$

Input

Input is given from Standard Input in the following format:

N
A_1 A_2 $\ldots$ A_N

Output

Print the maximum possible beauty of the painting.

Sample Input 1

```
3
3 6 5
```

Sample Output 1

```
12
```

If we paint $3, 6, 5$ in blue, red, blue, respectively, the beauty will be $(6) + (3 \oplus 5) = 12$.

There is no way to paint the integers resulting in greater beauty than 12, so the answer is 12.

Sample Input 2

```
4
23 36 66 65
```

Sample Output 2

```
188
```

Sample Input 3

```
20
1008288677408720767 539403903321871999 1044301017184589821 215886900497862655 5042774961116
05629 972104334925272829 792625803473366909 972333547668684797 467386965442856573 755861732
751878143 1151846447448561405 467257771752201853 683930041385277311 432010719984459389 3191
04378117934975 611451291444233983 647509226592964607 251832107792119421 827811265410084479
864032478037725181
```

Sample Output 3

```
2012721721873704572
```

A_i and the answer may not fit into a 32-bit integer type.