1 String Concatenation

You are given three strings a, b, c consisting of lowercase English letters. Calculate the length of the shortest string s such that all three strings a, b, c are continuous substrings of s.

Input Format

- Three lines with strings a, b, c respectively.

Output Format

- Output a single integer, the required length.

Examples

Input Example 1:

```
ab
cd
bc
```

Output Example 1:

```
4
```

Explanation:

One possible shortest string is "abcd", which contains "ab", "cd", and "bc" as substrings.

Input Example 2:

```
aaa
bbb
ccc
```

Output Example 2:

```
9
```

Input Example 3:

```
abababab
ababab
ba
```

Output Example 3:

```
8
```

Data Scale

- For 30% of the test cases, $1 \leq |a|, |b|, |c| \leq 100$
- For all test cases, $1 \leq |a|, |b|, |c| \leq 10^5$

2 Robotics Signal Analysis

Imagine you are an engineer working on a next-generation robotics system. The robot uses a series of signals, represented as integers, to communicate its movements and operations. Your task is to decode these signals to identify the two signals that interact most strongly.

Task

Your goal is to maximize the interaction strength between two signals. Interaction strength between two signals is defined as the **bitwise XOR** of their values. To achieve this, you need to:

1. Read a sequence of n signal values from the robot's system.
2. Identify the two signals that produce the highest interaction strength.

Input Format

- The first line contains an integer n, the number of signals.
- The second line contains n integers, representing the signal values.

Output Format

- Output the maximum interaction strength achieved between any two signals.

Examples

Input Example 1:

```
4
1 2 3 4
```

Output Example 1:

```
7
```

Explanation:

The XOR of signal values 3 and 4 gives the maximum interaction strength of 7.

Input Example 2:

```
4
1 16 17 3
```

Output Example 2:

```
19
```

Explanation:

The XOR of signal values 3 and 16 gives the maximum interaction strength of 19.

Data Scale

Let n represent the number of signal values. The constraints are as follows:

- For 40% of the data, $1 \le n \le 50$.
- For 70% of the data, $1 \le n \le 1000$.
- For 100% of the data, $1 \le n \le 50000$.

Each signal value is an integer in the range $0 \le \text{signal value} \le 10^{18}$.

3 Network Cable Management

Imagine you are an IT administrator tasked with managing a large-scale network. The network consists of n computers, each represented by a unique number from 1 to n. Initially, each computer is in its own isolated group.

Task

Your job is to perform a series of operations to manage the network:

1. **Connect Operation** $M\ i\ j$: Connect the group containing computer i to the group containing computer j, forming a single network group. The order of computers in the group is preserved, with i's group appearing before j's group. It is guaranteed that i and j are in different groups.

2. **Query Operation** $C\ i\ j$: Check whether computer i and computer j are in the same group. If they are, output the number of computers between them in the group. If they are not, output -1.

Input Format

- The first line contains an integer T, the total number of operations.
- Each of the next T lines contains one operation in one of the following formats:
  - $M\ i\ j$: Connect the groups of computers i and j.
  - $C\ i\ j$: Query whether computers i and j are in the same group.

Output Format

- For a connect operation, output nothing.
- For a query operation, output the number of computers between i and j if they are in the same group, or -1 otherwise.

Examples

Input Example 1:

```
4
M 2 3
C 1 2
M 2 4
C 4 2
```

Output Example 1:

```
-1
1
```

Explanation:

```
Step        | Group 1       | Group 2       | Group 3       | Group 4
--------------------------------------------------------------------
Initial     | 1             | 2             | 3             | 4
--------------------------------------------------------------------
M 2 3       | 1             |               | 3             | 4
            |               |               | 2             |
--------------------------------------------------------------------
C 1 2       | Computers 1 and 2 are not in the same group.
            | Output: -1
--------------------------------------------------------------------
M 2 4       | 1             |               |               | 4
            |               |               |               | 3
            |               |               |               | 2
--------------------------------------------------------------------
C 4 2       | Computers 4 and 2 have one computer (3) between them.
            | Output: 1
--------------------------------------------------------------------
```

Data Scale

Let T represent the total number of operations:

- For 20% of the data, $1 \leq T \leq 100$.
- For 30% of the data, $1 \leq T \leq 1000$.
- For 60% of the data, $1 \leq T \leq 100000$.

- For 100% of the data, $1 \le T \le 500000$.

4 Placing Tiles

You are given an $n \times m$ chessboard whose rows are numbered from 0 to $n-1$ (top to bottom) and columns from 0 to $m-1$ (left to right). Each cell is either `empty` or contains an `obstacle`. A cell (i, j) is *black* if $i + j$ is even, and *white* otherwise. You have an infinite supply of L-shaped tiles. The tile occupies exactly three cells: one "corner" cell and the two orthogonally adjacent cells. Note that the corner cell of each L-shaped tile must be placed on a black cell of the chessboard.

A placement of tiles is valid if:

- Tiles do not overlap.
- Tiles do not cover obstacle cells.
- The corner of every tile lies on a **black** cell; consequently, each tile covers one black cell and its two adjacent white cells.

Your task is to compute the **maximum number of tiles** that can be placed on the board.

Input Format

- The first line contains two integers n and m ($1 \le n, m \le 50$).
- The next n lines describe the board, each containing a string of length m consisting of '`.`' (empty) and '`X`' (obstacle).

Output Format

Output a single integer: the maximum number of tiles that can be placed.

Examples

Example 1

```
4 4
....
X..X
....
..X.
```

Output 1:

```
2
```

Example 2

```
3 3
...
...
...
```

Output 2:

```
2
```

Example 3

```
5 6
X..X..
......
.....X
...X..
......
```

Output 3:

```
6
```

Data Scale

- For 20% of the test cases, $1 \leq n, m \leq 10$
- For 40% of the test cases, $1 \leq n, m \leq 20$
- For all test cases, $1 \leq n, m \leq 50$