Week 4 - 2nd Programming Contest League 2025, University of Birjand

Date: May 2025

Committee Members

Scientific Team
Technical Team
Executive Team

Problem A : Hardest Problem

You are given three non-negative integers x, y, and z. Determine whether there exist three non-negative integers a, b, and c satisfying the following three conditions:

$$a\&b = x$$

$$b\&c = y$$

$$a\&c = z$$

where & denotes the bitwise AND operation.

Input

Each test contains multiple test cases. The first line contains the number of test cases t ($1 \le t \le 10^4$). The description of the test cases follows.

The first and only line of each test case contains three integers x, y, and z ($0 \le x, y, z \le 10^9$) — the target values of $a\&b$, $b\&c$, and $a\&c$, respectively.

Output

For each test case, output `"YES"` if there exist three non-negative integers a, b, and c satisfying the above conditions, and `"NO"` otherwise.

Example

Standard Input	Standard Output
5 1 1 1 3 2 6 4 8 12 9 10 12 12730 3088 28130	YES YES NO YES NO

Note

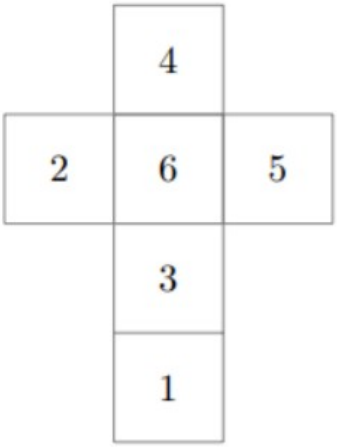
In the first test case, $a = 3$, $b = 5$, and $c = 9$ satisfy the conditions since $3\&5 = 1$, $5\&9 = 1$, and $3\&9 = 1$.

In the second test case, $a = 7$, $b = 3$, and $c = 22$ satisfy the conditions since $7\&3 = 3$, $3\&22 = 2$, and $7\&22 = 6$.

In the third test case, it can be proven that there are no three non-negative integers a, b, and c such that $a\&b = 4$, $b\&c = 8$, and $a\&c = 12$.

Problem B : Rolling-Dice Puzzle

Sarina and her brother, Soroush, are playing the rolling-dice game. The game is played on an $n \times m$ board. Initially, Soroush places a standard dice in one of the cells. It is place in a way that the number 6 is on the upper face, the number 4 is on the north face, and the number 2 is on the west face. In a standard dice, 6 is on the opposite side of 1, 2 is on the opposite side of 5, and 3 is on the opposite side of 4. Additionally, he selects some of the cells and writes arbitrary integers numbers from 1 to 6 in them.



After that, Sarina have to move the dice on the board by rolling it multiple times. The act of rolling is defined as follows: Suppose two adjacent cells A and B share an edge e and the dice is on the cell A; The dice can be rolled around its edge incident to e and moved from A to B. For example, consider the starting position of the dice. If the dice is rolled around the east, west, north, and south edges, the number appearing on the top face after rolling will be 2, 5, 3, and 4, respectively.

Whenever Sarina moves the dice to a a cell with a number in it in such a way that the number on the upper face of the dice matches the number in that cell, she gets a point. Note that Sarina can get a point from each cell at most one. The game is not that simple! There are obstacles in some of the cells and it is not possible to move the dice to the cells with an obstacle in it. Your task is to find out the maximum points that Sarina can get.

Input

The first line of input contains two integers n and m ($1 \leq n, m \leq 100$), indicating the number of rows and columns of the board, respectively. Each of the next n lines contain m characters, describing the board. Empty cells are represented by "." and obstacles are represented by "x". The starting position of the dice is represented by "s" and the selected cells are represented by the integers written in them (from 1 to 6). It is guaranteed that there is only one "s" in the input.

Output

Output a line containing the maximum points Sarina can get.

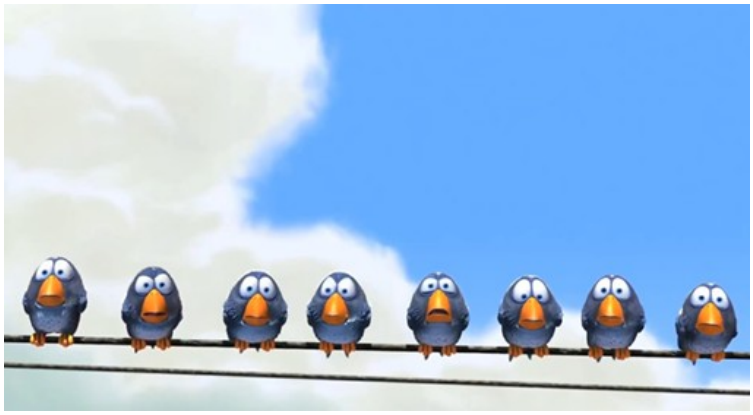
Example

Standard Input	Standard Output
3 4 .23s 4.2x xx.1	5

Standard Input	Standard Output
2 2 4s 22	1

Problem C : Birds Rituals

Birds are stupendous animals. Many species of them perform different rituals throughout their life; from courtship dances of peacocks to moonwalking of red-capped manakins. Among all, we are studying the permutation dance in this problem. This ritual is performed by a group of birds sitting in a row on a wire or tree branch, as shown in the figure.



The ritual can be simplified to a performance based on a sequence of actions of these types:

- **insertion**: A new bird joins the group and inserts herself somewhere in the row of the birds.
- **departure**: A bird in the row leaves the group for rest of the ritual and flies away.
- **relocation**: A bird in the row flies from her position and sits (inserts herself) somewhere else in the row.

Given the initial position of the birds in the row and the sequence of actions, your task is to compute the final position of the birds in the ritual.

Input

The input starts with a line containing two space-separated integers n ($1 \leq n \leq 1000$) and s ($1 \leq s \leq 5000$). The second line contains n space-separated bird names, as the initial configuration of the ritual (positioning of the birds in the row, from left to right). Each bird name is a non-empty string of at most 10 (lowercase) alphanumeric characters (a to z, and 0 to 9).

The sequence of actions is provided in the next s lines, one action per line. Each line is in one of the following formats based on the action type. The bird-name parameter in the actions has the similar format as the second line of the input.

- **insertion**: `insert bird-name position`

  The `position` parameter is an integer showing the number of birds to the left of the insertion position. This parameter is in the range $[0, M]$ where M is the total number of birds in the row before the insertion. Position 0 puts the bird in the beginning (leftmost position) of the row, and position M puts the bird in the end (rightmost position).

- **departure**: `depart bird-name`
- **relocation**: `relocate bird-name displacement`

The `displacement` parameter is an integer that can be positive, negative, or zero. The bird flies to her own position if the displacement is 0. Otherwise, the bird flies over k birds on her right (left) if displacement is positive (negative), where k is the absolute value of displacement. This parameter is in the range $[-L, +R]$ where L and R are respectively the numbers of birds to the left and to the right of the moving bird in the row before the relocation. Displacement $-L$ puts the bird in the beginning (leftmost position) of the row, and displacement $+R$ puts the bird in the end (rightmost position).

No two participating birds share the same name. Moreover, it is guaranteed that all the actions are meaningful at the moment of execution and there is always at least one bird on the branch throughout the ritual.

Output

Print a single line in the output containing the final configuration of the ritual. The line should contain the space-separated list of the bird names in the row (from left to the right).

Example

Standard Input	Standard Output
3 1 juju ashi mashi insert fifi 1	juju fifi ashi mashi

Standard Input	Standard Output
3 15 m1 m2 f insert m3 0 relocate m2 -2 relocate m1 -2 relocate m3 -2 relocate m2 -2 relocate m1 -2 relocate m3 -2 depart m2 relocate m1 1 relocate f 0 relocate m3 0 relocate f -1 relocate m3 -1 relocate m1 -2 relocate f -1	m1 f m3

Standard Input	Standard Output
4 5 hedwig hermes fawkes errol insert pigwidgeon 1 relocate hermes 2 depart fawkes insert buckbeak 0 depart hedwig	buckbeak pigwidgeon errol hermes

A video of the first two sample inputs is provided in the attachment package.

Copyright notice: the image of this problem are taken from the following addresses:

- Animation “For the Birds”, Pixar Animation Studios

Problem D : New Year and Pairs

You are given n integers $a_1, a_2, ..., a_n$. Find the number of pairs of indices i, j $(i < j)$ such that $a_i + a_j$ is a power of 2 (i.e., there exists an integer x such that $a_i + a_j = 2^x$).

Input

The first line contains the single positive integer n ($1 \leq n \leq 10^5$) — the number of integers.

The second line contains n positive integers $a_1, a_2, ..., a_n$ ($1 \leq ai \leq 10^9$).

Output

Print the number of pairs of indices i, j $(i < j)$ such that $a_i + a_j$ is a power of 2.

Examples

Standard Input	Standard Output
4 7 3 2 1	2

Standard Input	Standard Output
3 1 1 1	3

Note:

In the first example the following pairs of indices are included in the answer: (1, 4) and (2, 4).

In the second example all pairs of indices (i, j) (where $i < j$) are included in the answer.