Welcome to Code Bees (App Fest 1.0)

"First, solve the problem. Then, write the code."
– John Johnson

FCIT First Female Programming Competition
Organized by GDSC
FCIT
University of the Punjab

Problem A
PUCIT Campus Map!

Imagine PUCIT old campus to be on a map (2D grid), represented by an m x n matrix of binary values. Each "1" in the grid represents a building on the campus, while each "0" represents an empty space.

As a curious student, you want to know how many separate areas are there on the campus. An area is defined as a group of adjacent buildings (horizontally or vertically) that are not separated by any empty spaces.

Your task is to write a program that counts the number of areas on the PUCIT campus. You can assume that the edges of the grid represent the boundaries of the campus, so there are no buildings beyond the grid.

Can you help your fellow students find out how many areas are there on the PUCIT campus?

Input format:

The first line contains two integers N and M representing the number of rows and columns, there are N lines below that with M numbers (which can be 0 or 1).

Output format:

A single integer that are areas.

Example:

Input: grid =
4 5
1 1 1 1 0
1 1 0 1 0
1 1 0 0 0
0 0 0 0 0
Output: 1

Input: grid =
4 5
1 1 0 0 0
1 1 0 0 0
0 0 1 0 0
0 0 0 1 1
Output: 3

Constraints:
- The length of the 'grid' array should be equal to 'm'
- The length of each 'grid' array element should be equal to 'n'
- The values of 'm' and 'n' should be between 1 and 300 (inclusive)
- The value of each 'grid[i][j]' should be either '0' or '1'

Problem B

Chasing Jill – Hiking and Magic

Jack is trying to catch up to his friend Jill, who got separated from him on a hiking trail. Jack is currently at point N and Jill is at point K. Jack can either walk one step left or right in 1 second (from x to x-1 or x+1 in 1 second), or he can use a magic ability to instantly teleport to a position that is twice his current position (from x to 2*x in 0 second).

Your task is to calculate the shortest amount of time it would take for Jack to catch up to Jill.

Input format:

In the first line, you are given the position N where Jack is and the position K where the Jill is. N and K are integers.

$$0 \le N \le 100,000$$
$$0 \le K \le 100,000$$

Output format:

A single integer, the fastest time to find Jill.

Example:

Input:

5 17

output:

2

explanation:

time 0 : 5-->10 (Teleport)

time 1 : 10-->9 (Move Left)

time 1 : 9-->18 (Teleport)

time 2 : 18-->17 (Move Left)

Problem C
Nearest Element

Given an array of n numbers and a target number x, find the closest number in the array to x. The closest number is defined as the number in the array with the smallest absolute difference to x.

Input format:

The first line contains a single integer n (size of the given array) ($1 \leq n \leq 10^6$).

Second line consists of n integers ($r[1], r[2], r[3] \ldots r[n]$) ($-10^6 \leq r[i] \leq 10^6$)

The third line contains a single integer q (number of queries to answer) ($1 \leq q \leq 5 * 10^5$).

Next q lines consists of single integer x, for which we need to find answer ($-10^6 \leq x \leq 10^6$)

Output format:

A single integer in separate line for each x, i.e q lines

Sample Test Case 1

```
5
_8 2 _3 0 1
4
_20
5
1
_4
```

Sample Output 1

```
_8
2
1
_3
```

Note:

If the x is equally distant from two elements, print the smaller one.

e.g: arr = [-5, 5], x = 0. Answer will be -5.

Important: Be Careful of the constraints in input section.

Problem D

PUCIT Senate Hall

At PUCIT University, the Computer Science department wants to organize a graduation ceremony. The department has assigned each student a seat in the ceremony hall and labeled them from 1 to n. However, some students are not happy with their assigned seats and want to bribe others to swap seats with them. Each student can bribe at most two others and wear their original seat label. Determine the minimum number of bribes to get to a given seat order. If anyone has bribed more than two people, print "Too chaotic".

Write a function named minimumBribes, which takes an integer array q of size n representing the final state of the seat arrangement, where q[i] denotes the seat number of the i-th student. The function should print the minimum number of bribes necessary or "Too chaotic" if someone has bribed more than 2 people.

Input format:

The first line contains an integer t, the number of test cases. Each of the next t pairs of lines are as follows: The first line contains an integer n, the number of people in the ceremony. The second line has n space-separated integers describing the final state of the ceremony seats.

Output format:

For each test case, print the minimum number of bribes necessary or "Too chaotic" if someone has bribed more than 2 people.

Constraints

$1 <= t <= 10$
$1 <= n <= 10^5$
$1 <= q[i] <= n$

Examples

Input:

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

Output:

```
3
Too chaotic
```

Problem E

Maximizing Pieces

Trevor has a ribbon with a length of n. He wants to cut the ribbon in a way that satisfies two conditions. Firstly, either each resulting piece of ribbon should have a length of a, b, or c. Secondly, the total number of ribbon pieces should be as high as possible.

Can you help Trevor achieve his goal and determine the maximum number of ribbon pieces he can obtain through the required cutting?

Input:

The first line contains four space-separated integers n, a, b and c the length of the original ribbon and the acceptable lengths of the ribbon pieces after the cutting, correspondingly. The numbers a, b and c can coincide.

$$1 \leq n, a, b, c \leq 4000$$

Output:

Print a single number, the maximum possible number of ribbon pieces. It is guaranteed that at least one correct ribbon cutting exists.

Example:

Input:

5 5 3 2

Output:

2

Explanation:

In the above example, Trevor can cut the ribbon in such way: the first piece has length 2, the second piece has length 3.

Problem F

Array Alchemy

Your mathematics teacher, Ms. Noor, is impressed by the overall performance of her students in the last quiz, and she wants to test their mental abilities in a unique way. Instead of giving them a question, she has provided the answer y, and the students are required to find out the question x.

Here's how the problem goes: Assume an array x of non-negative integers of length n. For each element of x, there exists a non-negative maximum a_i, such that $a_i = max(a_1, a_2, ..., a_{i-1}, 0)$. For example, if the array x = {0, 1, 2, 0, 3}, then a = [0, 0, 1, 2, 2]. Then, Ms. Noor calculated the answer array y by subtracting a_i from x_i.

So, the answer array y would be [0, 1, 1, -2, 1].

Ms. Noor gives you the answer array y and expects you to reverse-engineer it to provide the question array x.

Input

The first line of the input contains an integer n ($3 \leq n \leq 200000$), which is the number of elements in the answer array.

The second line of the input contains n space-separated integers: $y_1, y_2, ..., y_n$ ($-10^9 \leq n \leq 10^9$)

It is guaranteed that for the given array y, there exists a solution x.

Output

Print n space-separated integers, $x_1, x_2, ..., x_n$ ($0 \leq x_i \leq 10^9$), such that if you calculate a according to the statement, y_i will be equal to $x_i - a_i$.

Sample Test Case 1

```
5
0 4 4 -3 1
```

Sample Output 1

```
0 4 8 5 9
```

Sample Test Case 2

```
5
6 4 6 6 5
```

Sample Output 2

```
6 10 16 22 27
```