Hello ACM 2025

ACM 社团出题组

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A. Arahc and an Array

Problem Statement

Arahc has a sequence a_n of size $n\,(1 \le n \le 10^5)$. He wants you to sort it in ascending order.

You can perform at most 3×10^5 operations. In each operation, you select an index i, and reverse the substrings $a_{1\ldots i-1}$ and $a_{i+1\ldots n}$ (If exists). For example, if the sequence is $1, 4, 3, 5, 3, 2$ and you select $i = 4$, the sequence will become $3, 4, 1, 5, 2, 3$.

If no solution within 3×10^5 operations exists, output -1.

Input Format

The first line contains a single integer $T\,(1 \le T \le 5)$, the number of test cases. For each test case:

The first line contains a single integer $n\,(1 \le n \le 10^5)$, the size of the sequence.

The second line contains n integers $a_1, a_2, \ldots, a_n\,(1 \le a_i \le n)$.

Output Format

For each test case:

If no solution within 3×10^5 operations exists, output -1.

Otherwise, the first line contains a single integer $k\,(1 \le k \le 3 \times 10^5)$, the number of operations you will perform.

The next line contains k integers $i_1, i_2, \ldots, i_k\,(1 \le i_j \le n)$, where i_j is the index you select in the j-th operation.

Example

Input #1:

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

Output #1:

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

B. Brahc in a String Game

Problem Statement

Brahc and Winlere are playing a game with a binary string. Brahc moves first. On each turn:

- Brahc may delete **any even-length** substring consisting of identical characters.
- Winlere may delete **any odd-length** substring consisting of identical characters.

The player who cannot make a move loses.

Before each round starts, they will take the binary string from the **previous round's game** and choose one contiguous segment to **flip all bits** in it (turning `0` into `1` and `1` into `0`).

Given that both Brahc and Winlere play optimally, determine the winner for each round.

Input Format

The first line contains two integers n, q ($1 \le n \le 2 \times 10^5, 1 \le q \le 10^6$), the length of the binary string and the number of rounds.

The second line contains n numbers, each number is either 0 or 1, representing the initial binary string.

The next q lines, each containing two integers l, r ($1 \le l \le r \le n$), represent the segment to flip in the current round.

Output Format

q lines, each line contains either `Brahc` or `Winlere`, representing the winner of the corresponding round.

Example

Input #1:

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

Output #1:

```
Winlere
```

C. Crahc with a String

Problem Statement

Crahc gives you a string S consisting `a`, `b` and `c`. Denote the length of S as $n\,(1 \leq n \leq 10^4)$.

You need to convert S into the decimal representation of n. For example, convert the string `abbac` into `5`.

Each conversion step involves two strings $X, Y\,(|X|, |Y| \leq 10^4)$, where X is not a substring of Y (also, X is not empty). Note that both X and Y can only consist of lowercase letters or digits. The single conversion step is defined as follows:

1. Find the first occurrence of X in S.
2. Replace the first occurrence of X with Y.
3. Repeat the above steps until no more occurrences of X can be found in S.

Crahc is impatient, so you can only perform up to 20 steps. At any time (including when performing one step), the length of S should not exceed 10^4.

Note that this problem does not require any input. You are only required to provide the steps for your conversion. Your solution must work for all valid strings.

Format

The first line contains a single integer $k\,(1 \leq k \leq 20)$, the number of conversion steps you will perform.

The next k lines, each line contains two strings X, Y, separated by a comma, representing the conversion step from X to Y.

Example

The example is for illustration of the format only; it may be incorrect.

```
3
bb,
ac,2x
a2x,5
```

It works for $S =$ `abbac`.

D. Drahc Designs the Map

Problem Statement

After graduation, Drahc joined YiHoMo and became a game designer. He has finished an outline of a map for his new game. There are several places on his map.

However, his boss, Teafrogsf, has proposed several suggestions that require Drahc to modify the map. After days and nights of revisions, Drahc fainted. But there still exists a last requirement for the map. You decide to assist him.

For convenience, we use a positive weighted undirected graph $G = (V, E)$ to represent the map. This requirement requires that for all spanning subgraphs of G, there exists a **unique** spanning subgraph that has a minimum sum of weight. In other words, $\exists! G' = (V, E')$ s.t. $\sum_{e \in G'} w(e)$ minimizes $(E' \subset E)$.

Drahc's map is under protection, so you can only modify one edge $e \in E$ at one time with its weight increased by 1. Drahc wants his map to be modified as little as possible. Therefore, you need to modify as few times as possible, and since the modification method may not be unique, you only need to output the minimum number of modifications.

Input Format

The first line of input contains 2 integers: $n, m\,(1 \leq n \leq 10^5, 1 \leq m \leq 2 \times 10^5)$. n represents the number of vertices in G and m represents the number of edges in G.

The next m lines, each containing 3 integers each: u_i, v_i and $w_i\,(1 \leq u_i, v_i \leq n, 1 \leq w_i \leq 10^9)$. It means there exists an edge between u_i and v_i which is weighted w_i.

Output Format

You only need to output one integer: the minimum number of modifications.

Example

Input #1:

```
6 8
1 2 1
1 3 1
```

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

Output #1:

```
2
```

E. Erahc Counts Aya

Problem Statement

The tengu races across Gensokyo at the highest speed together with the crows.
As the newspaper extras fly about, Gensokyo's newspaper girl Aya Shameimaru looked for youkai to serve as story material.

Erahc feels Syameimaru Aya is very cute. What concerns Erahc even more is that, Aya has a habit of frequently adding `ayayaya` or similar sounds when she speaks. Erahc wants to find out the upper limit of how many times she uses such a pet phrase.

Since Erahc knows little about algorithms, so he leaves the problem to you.

Formally, you are given T strings, each representing something Aya has said. For each string, count how many substrings match the regex pattern `a(ya)+` —that is, substrings like `aya`, `ayaya`, `ayayaya` and so on.

Note that overlapping occurrences are allowed and should be counted. For example, in `ayaya`, the substrings `aya` (starting at position 1) and `aya` (starting at position 3) both count.

Input Format

The first line contains a single integer T ($1 \leq T \leq 10^3$), the number of test cases.

The next T lines, each contains a non-empty string s ($1 \leq |s| \leq 10^7$), consisting of visible ASCII characters (**including spaces**).

The total length across all strings s does not exceed 2×10^7.

Output Format

For each test case, output a single integer, representing the number of substrings.

Example

Input #1:

```
5
a
ya
```

```
Syameimaru aya!
ayayayaya
oayaoayayaoyaay.
```

Output #1:

```
0
0
1
10
4
```

F. Frahc Finds Forgotten Spell

Problem Statement

As a great wizard, Frahc will one day find the ultimate forgotten great spell. At present, Frahc has been informed that the spell lies in a rooted binary tree, where the node with index 1 is the root.

There is a spell written on each node. The spell on node i is s_i. Obviously, since these spells have been written, they must not be the ultimate forgotten great spell. However, Frahc has seen through everything: the forgotten spell —just like its epithet —is the mex of the spells. The mex of a set of non-negative integers is defined as the minimal non-negative integer that is not in the set. Specifically, Frahc can explore one path in the tree, if so, he will learn the forgotten spell of the path.

Frahc believes the smaller the forgotten spell is, the more primitive the spell is, then the more likely the spell is the ultimate forgotten great spell. Also, Frahc likes longer paths. So he defines the priority of a path is the length of the path minus the forgotten spell of the path.

Frahc wants to find the maximum priority among all the paths, for each subtree. Since Frahc is a great wizard, not a great programmer, he leaves the problem to you.

Input Format

The first line contains one integer $n\,(1 \leq n \leq 3 \times 10^5)$, the size of the binary tree.

The second line contains n numbers $w_1, w_2, \ldots, w_n\,(0 \leq w_i < n)$.

The third line contains $n-1$ numbers $fa_2, fa_3, \ldots, fa_n (1 \leq fa_i < i)$, where fa_i is the parent node of node i.

Output Format

One line with n numbers. The i-th number is the maximum path weight in node i's subtree.

Example

Input #1:

```
7
2 1 0 0 1 1 0
1 1 2 3 2 6
```

Output #1:

```
3 2 1 0 1 1 0
```

G. Grahc Plays Gokémon Po

Problem Statement

Grahc is playing a game called "Gokémon Po" and he has caught a lot of "Gokémon". Every type of Pokémon has a unique positive integer as its ID. Grahc found that there exists a special item that can transform one type of Gokémon into another type of a **strictly larger** ID, with the result only depending on its original ID. In other words, there exists a function f, if the original ID of the Gokémon is x, the ID of the Gokémon after transformation will be $f(x)$.

After several trials, Grahc found that if he uses the item twice in a row on a Gokémon of ID x, it will be transformed into a Gokémon of ID $3x$, no matter what x is.

Grahc wonders what the ID of the transformed Gokémon is if he only uses it once on a Gokémon of ID x. He wants you to write a program to predict it. One thing to notice is that Grahc has so many Gokémon, so he may ask you for more than one ID in one case.

That is, given a monotonic incremental function $f : \mathbb{N}^* \mapsto \mathbb{N}^*$ satisfying $f(f(x)) = 3x$. Now find $f(x_i)$ for given x_i.

Input Format

The first line of each input case contains an integer T ($1 \leq T \leq 10$) that represents how many IDs he wants you to predict.

The following T lines contain one integer x_i($1 \leq x_i \leq 10^{18}$) each, representing the ID of the i-th Gokémon before transformation.

It is guaranteed that the sum of all x_i does not exceed 3^{38}.

Output Format

For every ID x_i, print the ID of the i-th Gokémon after transformation $f(x_i)$.

Example

Input #1:

```
1
4
```

Output #1:

```
7
```

Input #2:

```
2
1
2
```

Output #2:

```
2
3
```

H. Hrahc Likes 114514

Problem Statement

Hrahc is a 24-year-old student. He likes a number `114514` very much.

Now Hrahc gets a string with numbers. He wants to know how many times the number `114514` appears as a subsequence (not substring, notice that subsequence is not required to be contiguous) in the string.

Input Format

The first line contains a single integer n ($1 \leq n \leq 10^6$), the length of the string.

The second line contains a string of length n, consisting of digits from `0` to `9`.

Output Format

Only one integer: the number of times the number `114514` appears as a subsequence in the string.

Example

Input #1:

```
6
114514
```

Output #1:

```
1
```

Input #2:

```
7
1114514
```

Output #2:

```
3
```

I. Irahc inside Icy Caves

Problem Statement

Irahc is an experienced explorer leading an expedition trapped in a vast icy cave system. The team has m members (including Irahc). The caves form a straight line of n connected chambers, each capable of sheltering a certain number of team members. Some chambers are so small that they cannot accommodate even a single person. Specifically, the i-th chamber can house a_i members.

The entire expedition team, including Irahc, must be assigned to these chambers. As the team leader, Irahc wants to minimize the distance to the farthest member from himself, measured by the number of caves between them along the line.

As Irahc's assistant, you need to determine the smallest possible maximum distance between Irahc and any other team member.

If it is impossible to house all members in the available caves, output `-1`.

Input Format

The first line contains two integers n, m ($1 \le n \le 10^6, 1 \le m \le 10^9$), the number of chambers and the number of team members.

The second line contains n integers $a_1, a_2, \ldots, a_n$ ($0 \le a_i \le 10^6$), where a_i is the capacity of the i-th chamber.

Output Format

Only one integer: the smallest possible maximum distance between Irahc and any other team member. Or `-1`, if it is impossible to house all members.

Example

Input #1:

```
2 3
1 1
```

Output #1:

```
-1
```

Input #2:

```
3 2
1 0 1
```

Output #2:

```
2
```

J. Jrahc as a Jewelbreaker

Problem Statement

Jrahc has developed a jewel-breaking game. In this game, you can process diamonds by striking them with a chosen force.

Specifically, for a diamond of size x, you may choose a positive integer $y < x$. According to the game's rules, the diamond will disappear, and for each divisor z of y, a diamond of size z will be generated with probability $\frac{z}{y}$.

In particular, diamonds of size 1 cannot be struck.

Clearly, this game may violate the law of conservation of matter. After being criticized by Coinred, Jrahc refused to change the code and instead posed a game theory challenge to him:

Suppose there are several diamonds in the game. We take turns processing them, with me going first. On each turn, you must strike the largest diamond currently present. If all diamonds are of size 1, the player who cannot make a move loses. What is my probability of winning if we both play optimally?

Coinred must correctly answer this question to convince Jrahc to change his game, but he is not good at game theory—so he has come to you for help.

Input Format

The first line contains one integer $n\,(1 \le n \le 110)$, the number of diamonds.

The second line contains n integers $a_1, a_2, \ldots, a_n\,(1 \le a_i \le 110)$, the sizes of the diamonds.

Output Format

One rational number, representing the probability of winning, formatted to six decimal places.

Example

Input #1:

```
2
1 2
```

Output #1:

```
1.000000
```

Input #2:

```
2
2 2
```

Output #2:

```
0.000000
```

K. Krahc Paints KPH

Problem Statement

Krahc is painting KPH.

KPH is abstract. He can be represented as a graph with n vertices and m edges.

Krahc's draft is abstract. It only contains the line art, so Krahc asks you to add colors.

Krahc's colors are abstract, so each color can be abstracted as a positive integer.

Krahc is abstract, so he hates monochromatic cycles. He hopes you can ensure that there are no monochromatic cycles in the painting while helping him color it.

Krahc doesn't like abstract, so he hopes you can provide the least abstract coloring scheme.

The definition of abstractness is abstract. A scheme is less abstract than another if for the first edge that differs in color, its color is smaller.

Input Format

The first line contains two integers n, m ($1 \leq n, m \leq 10^6$), representing the number of vertices and edges of KPH.

The next m lines, each containing two integers u_i, v_i ($1 \leq u_i, v_i \leq n$), represent an edge between vertices u_i and v_i.

Output Format

m lines, each containing one integer, representing the color of the corresponding edge in the input. The colors should be positive integers, and there should be no monochromatic cycles in the graph.

It is guaranteed that a solution exists.

Example

Input #1:

```
2 2
1 2
1 2
```

Output #1:

```
1
2
```