Problem 1
To come.

Problem 2 http://www.spoj.com/problems/BALSUBTR/
You work in a telecommunication company, and now you are involved in a project responsible for making the system resilient to failuers.

In a very simplified model, the network run by your company is a tree, and therefore for each pair of nodes there exists a unique path that connects these nodes. Conversely, for every edge we can calculate the number of pairs that use this edge.

Your task is to find an edge in the graph that maximizes the number of pairs that use this edge, as such an edge is the most critical part of the network — its failure will disconnect the most nodes.

Input

First line of input consists of one number n, the number of nodes in the network.

In the next n-1 lines you will be given the description of edges of the tree. Every line consists of two number u and v, meaning that between nodes u and v there exists an edge.

Output

Your program should output a single edge which disconnects the most nodes. Vertices of the edge should be ordered (i.e., 2 4 instead of 4 2). If there exist many edges that disconnect the same number of nodes, then you should output the one which is first lexicographically (i.e., 2 5 instead of 3 4).

Example
```
Input:
4
1 2
2 3
3 4
Output:
2 3

Input:
4
1 2
2 3
2 4
Output:
1 2
```

Problem 3 http://www.spoj.com/problems/ROADWORK/
The city center of Gotham has a shape of a grid, where parallel and perpendicular roads separate giant buildings. Every now and then it happens that a local celebrity Batman has a beef with people who question his popularity in Gotham. After the last one, some streets in the center of Gotham require

renovation. The city is overly sensitive when it comes to safety, so the procedures state that at every moment there should be a way of evacuating the critical points of the city (e.g., hospitals, town hall) in a way that the evacuation paths do not cross. The problems is much more serious than it sounds. If the renovations are scheduled poorly, and evacuation safety is compromised so that many critical points share the same piece of evacuation paths then there is a substantial risk that terrorists will try to exploit this fact in their next attack on the city.

Therefore, it's the task of the city engineer to schedule repair works, and since you are the most famous programmer in Gotham he turned to you for help. He needs a program that for a given outline of the center of Gotham will output if it is possible to find non-crossing evacuation paths for all critical points.

Now it's up to you to help the city recover after the last incident. Be the hero that Gotham needs.

Input

In the first line of the input you are given two numbers H and W — the height and the width of the grid that represents.

In the next 2H-1 lines you are given the description of the city center. Each line consists of 2W-1 characters indicating if the road is out of use or not, and which buildings are the critical points.

Sign + represents a crossing. It can never be out of use. Signs - and | represent an operating road. Blank sign denotes renovated road that is out of use. For simplicity we assume that on the map a critical point is not a building but a road that is closest to the exit from the building.

Output

You need to output a sinlgle word YES if it is possible to find non-crossing paths from the critical points to the boundaries of the city. And NO if it is not possible.

Example

```
Input:
3 3
+-+-+
| c |
+c+c+
| c |
+-+-+
Output:
YES

Input:
3 4
+-+-+-+
| c c |
+c+c+c+
| c c |
```

```
+-+-+-+
Output:
NO
```

Problem 4 http://www.spoj.com/problems/OCCURRS/

Your friend is a biologist doing research on the structure of DNA. He wants to investigate how much a certain feature depends on the number of occurrences of the gene that causes it in the DNA of a person.

For this purpose he needs your help. You need to write a program that will take a part of DNA sequence, and a pattern. Your program needs to calculate how many times the pattern appears as a subsequence of the DNA sequence.

Input

In the first line your program reads T, the number of test cases.

Every test consists of two lines. First with the DNA sequence and second with the pattern.

Output

For every test output a single number, the total number of occurrences (as a subsequence) of the pattern in the sequence.

Example

```
Input:
3
ACGTACGT
AT
AAAAA
AA
CGT
A
Output:
3
10
0
```

Problem 5 http://www.spoj.com/problems/AWEPARTY/

Your friend wants to organize a party. He wants the party to be awesome, and so he wants to upfront guarantee that all the people will know enough other people. In case someone will know too little other people he may decide not to invite him or try to bring more people whom he does now. He created a shortlist of guests, and he asked every person on that list about what other people he/she knows from the shortlist. To make the process efficient and user friendly, he only asked about the number of other people a persons knows, not about precise indication of such people. We asked each person to consider other person to be known by him, if she believes that another person would say the same about him (so your friend considers only symmetric acquaintances). Also a person cannot indicate himself/herself.

Even though the process was simple, there could be some errors. Before your friend makes some decisions, he wants to be sure that the data was collected

more or less OK. To do so he wants to know if there exists a configuration of people knowing each other so that the sequence of number of known people is the one as collected from the shortlisted guests.

Input

In the first line you are given number T, the number of test cases.

In first line of each test, you are given number n.

In the second line of the test you are given n numbers a1,a2,...,an.

Output

You need to return YES, if there exists a configuration of people knowing each other such that person i knows bi other people, and sequences a1,a2,...,an and b1,b2,...,bn are equal (modulo permutations).

Return NO, if no such a configuration exists.

Example

```
Input:
2
6
3 3 2 2 1 1
3
2 2 1
Output:
YES
NO
```

Theory Problem

Your grandfather loves riddles they publish in the Sunday newspaper. The last week riddle was as follows. You are given a grid $n \times n$ with n rows and n columns. For every row i you are given number r_i and for every column j you are given number c_j. To solve the riddle you need to mark some points on the grid, in the following way:

1. the number of marked points in every row is at most r_i,

2. the number of marked points in every column is at most c_j,

3. you mark the maximum number of points that satisfy 1. and 2.

The task is actually really difficult, so no wonder your grandfather has problems solving it. Your grandfather solved every riddle that the newspaper published in the last 44 years, so your heart is full of pain seeing him struggling with this week's one, and doubting his riddle-solving skills. You need to solve the riddle, but the solution you come up with has to be simple — you obviously cannot tell your grandfather that he needs to run a max-flow algorithm.

Task

Give an algorithm that will take time linear or near-linear in n. Near linear means that you can have additional logarithmic factors in the complexity, so $O(n \cdot \lg^7(n))$ is still fine, while $O(n^2)$ is unacceptable. State an algorithm in the pseudocode, prove its correctness and near-linear time complexity. No implementation is required here.

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