Croatian Open Competition in Informatics

Round 3, December 14th 2019

Tasks

Task	Time limit	Memory limit	Score
Preokret	1 second	512 MiB	50
Grudanje	2 seconds	512 MiB	70
Drvca	1 second	512 MiB	110
Lampice	5 seconds	512 MiB	110
Sob	1 second	512 MiB	110
Total			450

Task Preokret

It's *Saint Stephen's Day*, the day after Christmas. The secular version of the same holiday in England is known as *Boxing day*. While people in Croatia celebrate Saint Stephen's Day by stuffing themselves with ridiculous amounts of food, our British friends traditionally play football. Premier league, Championship, amateur leagues – everybody plays football on Boxing day.

This year, Pep ate too much roast beef on Christmas and decided to take a break from Boxing day football. He stayed in bed that day, analyzing an old City fixture against an unknown opponent.

Pep knows that there were N goals scored during the match and he also knows in which order were they scored. He watches the game and wishes to answer the following questions

1. What was the final score, i.e., how many goals did City score and how many goals did their opponents score?
2. How many different ties were featured during the course of the game? We say that the game is tied if both teams have scored the same number of goals. The starting score `0:0` is also considered a tie.
3. Let's define a *turnover* as a situation in which a losing team, i.e. the team that scored less goals than its opponent, scores a certain number of successive goals and takes the lead after those goals have been scored. Pep wonders what is the largest turnover in the game. In other words, he wants to know what was the largest number of successive goals scored by one team such that before those goals they were losing and after those goals they were winning. Pep knows that this specific game had at least one turnover.

Input

First line contains an integer N ($1 \leq N \leq 250$) from the task description.

In the next N lines there is a single number 1 or 2 which represents a team that scored a goal (in order of goals scored in the game). City is denoted by number 1 and their opponents by number 2.

Output

In the first line you should output two space-separated integers, the number of goals scored by City and the number of goals scored by the opposing team.

In the second line you should output the number of different ties featured during the course of the game.

In the third line you should output the largest turnover in the game.

Scoring

In this task, each line of output is graded separately. The correct output in the first line is worth 1 point in each test case. The correct output in the second line is also worth 1 point in each test case. The correct output in the third line is worth 3 points in each test case.

Examples

input

```
5
1
1
2
2
2
```

output

```
2 3
2
3
```

input

```
9
1
2
2
1
1
1
2
1
1
```

output

```
6 3
3
3
```

input

```
3
2
1
1
```

output

```
2 1
2
2
```

Explanation of the first example: Different scores during the game were: `0:0`, `1:0`, `2:0`, `2:1`, `2:2`, `2:3`. Out of those, there were two ties: `0:0` and `2:2`. The largest turnover happened when the opposing team were losing `2:0` and then scored three successive goals, thereby winning `2:3`.

Explanation of the second example: Different scores during the game were: `0:0`, `1:0`, `1:1`, `1:2`, `2:2`, `3:2`, `4:2`, `4:3`, `5:3`, `6:3`. Out of those, there were three ties: `0:0`, `1:1` and `2:2`. The largest turnover happened when City were losing `1:2` and then scored three successive goals and started winning `4:2`.

Task Grudanje

Patrik loves to study the words in English language. He especially loves words that contain exactly N letters. When he sees such a word, he instantly starts observing Q of its subwords and for each of those subwords he determines whether all of its letters are distinct. If that is the case for each of the Q subwords, then he considers the original word to be perfect.

Krešimir doesn't love studying English words, he loves to throw snowballs at Patrik instead. On a cold, winter morning, he was walking around town carrying exactly N snowballs and stumbled upon Patrik who was observing a giant N-lettered word that was written on the wall by some hooligans. What a coincidence...

Krešimir fiercely threw the first snowball in Patrik's direction, but Patrik skillfully dodged the snowball so it hit and completely covered the p_1-st letter of the word on a wall. In a similar manner, Krešimir failed to hit Patrik with the next $(N-1)$ snowballs. More precisely, his i-th snowball missed Patrik and completely covered the p_i-th letter of the word on a wall. Interestingly enough, after Krešimir threw all of the snowballs, the entire word was covered in snow.

Patrik glanced at the completely covered word and concluded that it was perfect. Therefore, he needed to slightly alter his definition of a perfect word. The word is perfect in none of the Q subwords contain two equal letters that are not covered in snow. Now he wants to know after which snowball (possibly zero) did the word on the wall become perfect.

Input

The first line contains a word that consists of N ($1 \leq N \leq 10^5$) lowercase letters from the English alphabet.

The second line contains an integer Q ($1 \leq Q \leq 10^5$) from the task description.

The i-th of the next Q lines contains two integers a_i and b_i ($1 \leq a_i \leq b_i \leq N$) which denote that the i-th of the Q subwords from the task description spans from a_i-th to the b_i-th letter of the word on a wall.

The next line contains N different integers p_i ($1 \leq p_i \leq N$) from the task description.

Output

In the only line you should output after which snowball (possibly zero) did the word on the wall become perfect.

Scoring

In test cases worth a total of 14 points, it will hold $1 \leq N, Q \leq 500$.
In test cases worth additional 21 points, it will hold $1 \leq N, Q \leq 3000$.
In test cases worth additional 14 points the word will only contain letters `'a'`.

Examples

input

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

output

```
2
```

input

```
abbabaab
3
1 3
4 7
3 5
6 3 5 1 4 2 7 8
```

output

```
5
```

input

```
abcd
1
1 4
1 2 3 4
```

output

```
0
```

Clarification of the second example:

The state of the word on the wall after each thrown snowball is:

```
abbab*ab
ab*ab*ab
ab*a**ab
*b*a**ab
*b****ab
******ab
*******b
********
```

Task Drvca

Advent in Zagreb is a traditional holiday manifestation whose main attraction is a magical Christmas market located at the city centre. It should also be noted that this event was voted the best in Europe for three years in a row. Apart from travelling fast, good news also has the tendency to travel far. Indeed, the information about Advent in Zagreb reached North Pole and Santa Claus himself. Interestingly enough, Santa never visited Croatia (except for usual business on Christmas Eve). When you think about it, that makes sense since he doesn't really like summer activities by the sea and he can solve COCI problems from the comfort of his own home.

Luckily, he decided to visit our Christmas market so he sent a letter to the town hall stating that he will land on Zagreb's main square in the early morning of December 14th. After his on-site participation in a COCI round, he will have a guided tour of Zagreb's finest gastronomic sites by Mr. Malnar.

You are probably wondering: "How exactly does Santa plan to land, there is no runway there!". You are right, there is not, but we'll manage. The town hall already prepared N Christmas trees that should be featured on the main square. Now, they will simply take those trees and place them in two rows which will define the boundaries of the runway. For some reason they want to make the absolute difference in height between each two neighbouring trees to be the same in each row. Moreover, they want to have the trees sorted in each row from the shortest to the highest. Help them divide the trees into two rows that satisfy these conditions.

Input

The first line contains an integer N ($2 \leq N \leq 10^5$) from the task description.

The next line contains N integers h_i ($1 \leq h_i \leq 10^9$) that denote the heights of all N Christmas trees.

Output

In the first line you should output an integer A which represents the number of trees in the first row. In the second line you should output A integers which represent the heights of the trees in the first row of the runway.

In the third line you should output an integer B which represents the number of trees in the second row. In the fourth line you should output B integers which represent the heights of the trees in the second row of the runway.

The rows are not allowed to be empty ($A > 0$ and $B > 0$) and each tree should be a part of one row ($A + B = N$). Also, trees should be sorted in each row from the shortest to the highest. If there are multiple solutions, you can output any of them. If there is no solution which satisfies the necessary conditions, you should output -1 in the only line of output.

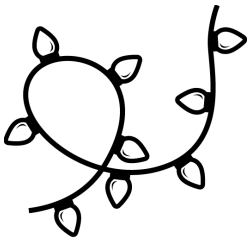
Scoring

Subtask	Score	Constraints
1	20	$N \leq 15$
2	30	$N \leq 300$
3	30	$N \leq 10^5$, there is a solution in which both rows have the same number of trees.
4	30	No additional constraints.

Examples

input	input	input
4 1 3 2 4	6 23 4 7 6 8 15	6 1 2 3 7 9 10
output	**output**	**output**
2 1 2 2 3 4	3 4 6 8 3 7 15 23	-1

Task Lampice



Mirko chose a Christmas tree for the upcoming holidays and decided to decorate it with Christmas lights. Christmas lights contain N LED lights that are connected via $(N-1)$ conductive wires such that all of the lights are connected. Additionally, we know the color of each Christmas light.

After he decorated the tree, Mirko proudly stared at his masterpiece. After a while, he started noticing different patterns. Among those patterns, he was particularly amazed by so-called *palindromic segments*. Palindromic segment is a segment of Christmas lights on the path between two fixed lights, u and v, such that the array of colors on a path from u to v is exactly the same as the array of colors on the path from v to u. Determine the length of the longest palindromic segment expressed in the number of lights on that segment.

Input

The first line contains an integer N $(1 \leq N \leq 50\ 000)$ from the task description.

The next line contains an array of N lowercase letters from the English alphabet where the i-th letter represents the color of the i-th Christmas light.

Each of the next $(N-1)$ lines contains two integers A and B $(1 \leq A, B \leq N, A \neq B)$, which denote that lights A and B are directly connected by a conducting wire.

Output

The first line of output should contain the length of the longest palindromic segment.

Scoring

Subtask	Score	Constraints
1	17	$N \leq 3000$
2	25	Light i is directly connected with light $i+1$ $(1 \leq i < N)$.
3	31	At most 100 lights are directly connected with exactly one other light.
4	37	No additional constraints.

Examples

input

```
7
imanade
1 2
2 3
3 4
4 5
5 6
6 7
```

output

```
3
```

input

```
4
aabb
1 2
1 3
3 4
```

output

```
2
```

input

```
8
acdbabcd
1 6
6 7
6 3
3 4
4 5
5 2
8 5
```

output

```
5
```

Task Sob

It was a dark and dreary Christmas Eve when our hero pondered, weak and weary, over a quaint and curious COCI task. When he nodded, nearly napping, suddenly he heard a tapping, tapping and a mighty roar. A giant reindeer broke through his chamber door, merely this and nothing more. While our hero's heart slightly fluttered, the beast simply uttered: *"I won't leave until you solve this problem"*.

In the problem you were given two integers N and M and you were supposed to perfectly match the numbers from sets $A = \{0, 1, 2, \ldots, N-1\}$ and $B = \{M, \ldots, M+N-1\}$ into N pairs, such that for the matched numbers $x \in A$ and $y \in B$ it holds $x \,\&\, y = x$, where $\&$ denotes a bitwise AND operation.

Input

The first line contains two integers N and M ($1 \leq N \leq M, N + M \leq 10^6$) from the task description.

Output

You should output N lines and in each line you should output two integers x and y, where x belongs to set A and y belongs to set B. Numbers in each line should correspond to one of the matched pairs from task description.

It is possible to prove that the solution always exists.

Scoring

Subtask	Score	Constraints
1	10	N is a power of 2
2	29	$N + M$ is a power of 2
3	39	$N + M \leq 1000$
4	32	No additional constraints.

Examples

input

```
1 3
```

output

```
0 3
```

input

```
3 5
```

output

```
0 5
1 7
2 6
```

input

```
5 10
```

output

```
0 12
1 13
2 10
3 11
4 14
```