

USA Computing Olympiad



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RESOURCES

USACO 2024 US OPEN CONTEST, PLATINUM PROBLEM 1. IDENTITY THEFT

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Contest has ended.

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English (en) ▼

****Note: The time limit and memory limit for this problem are 3s and 512MB, which are 1.5x and 2x the normal amount, respectively.****

Farmer John's N ($1 \leq N \leq 10^5$) cows each have a Farm ID number in the form of a bitstring (a string consisting of the characters '0' and '1'). Bessie, the eldest cow, has the Farm ID numbers of all the cows memorized, and likes to go around and ask cows their ID numbers.

When a cow is asked their Farm ID number, they will start to say the correct bitstring, but may get confused and stop before finishing it. When Bessie hears the bitstring, if it is not the Farm ID number of any cow on the farm, then she will shrug and walk off. However, if it is the ID number of a different cow than the one she asked, then she will assume that identity theft has occurred and place the farm into lockdown. Note that this can happen even when the cow says their full Farm ID number.

Farmer John would like to prevent this from happening, and is willing to change the cows' Farm ID numbers by adding some more bits to them. In one second, he can add one bit to the end of the Farm ID number of any cow. Figure out the minimum amount of time it will take for him to prevent a lockdown from ever occurring.

INPUT FORMAT (input arrives from the terminal / stdin):

The first line contains N , the number of cows on Farmer John's farm.

Then N lines follow. The k th line contains a bitstring equal to the Farm ID number of the k th cow on Farmer John's farm.

No cow's Farm ID number is empty, and the total length of all Farm ID numbers is at most 10^6 .

OUTPUT FORMAT (print output to the terminal / stdout):

Output the minimum number of seconds Farmer John needs to spend to ensure that a lockdown will never occur.

SAMPLE INPUT:

```
3
1
1
1
```

SAMPLE OUTPUT:

```
5
```

This sample satisfies the constraints for the first subtask.

We can make a lockdown impossible in 5 seconds by adding '0' to the first Farm ID number, '10' to the second Farm ID number, and '11' to the third Farm ID number, making the Farm ID numbers '10', '110', and '111'.

You can prove that this cannot be done in 4 or fewer seconds. For example, if you leave the Farm ID numbers as they are, then all 3 cows have the same Farm ID number '1', so when Bessie hears it it will always be the Farm ID number of another cow.

As another example, if you spend just 2 seconds to add '0' to the second Farm ID number and '1' to the third Farm ID number, then the Farm ID numbers are '1', '10', and '11', and so the second and third cows, when saying their Farm ID numbers, might stop in the middle and just say '1', which would be the Farm ID number of the first cow.

SAMPLE INPUT:

```
3
1
11
111
```

SAMPLE OUTPUT:

```
2
```

We can make a lockdown impossible in 2 seconds by adding '0' to the first two Farm ID numbers, making the Farm ID numbers '10', '110', and '111' like before. You can prove that this cannot be done in 1 second.

SAMPLE INPUT:

```
3
1
1
11
```

SAMPLE OUTPUT:

```
4
```

We can make a lockdown impossible in 4 seconds by adding '00' to the first Farm ID number and '01' to the second Farm ID number. You can prove that this cannot be done in 3 or fewer seconds.

SAMPLE INPUT:

```
5
0
01
0011
010
01
```

SAMPLE OUTPUT:

```
6
```

SAMPLE INPUT:

```
14
0
1
1
0
1
0
1
1
1
1
1
1
0
0
1
```

SAMPLE OUTPUT:

```
41
This sample satisfies the constraints for the first subtask.
```

SCORING:

- Inputs 6-7: All Farm ID numbers have length exactly 1.
- Inputs 8-15: $N \leq 10^2$ and the total length of the Farm ID numbers does not exceed 10^3 .
- Inputs 16-25: No additional constraints.

Problem credits: Benjamin Qi

Contest has ended. No further submissions allowed.