Contest Duration: 2025-08-09(Sat) 22:00 (http://www.timeanddate.com/worldclock/fixedtime.html?iso=20250809T2100&p1=248) - 2025-08-09(Sat) 23:40 (http://www.timeanddate.com/worldclock/fixedtime.html?iso=20250809T2240&p1=248) (local time) (100 minutes)

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G - Binary Operation

Editorial (/contests/abc418/tasks/abc418_g/editorial)

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Time Limit: 2 sec / Memory Limit: 1024 MiB

Score : 650 points

Problem Statement

There are 16 integer tuples (A, B, C, D) satisfying $A, B, C, D \in \{0, 1\}$. For each of them, solve the following problem.

A non-empty string S consisting of `0` and `1` is called a beautiful string when it satisfies the following condition:

- (Condition) You can perform the following sequence of operations until the length of S becomes 1 and make the only character remaining in S be `1`.
    1. Choose any integer i satisfying $1 \leq i \leq |S| - 1$.
    2. Define an integer x as follows:
        - If $S_i =$ `0` and $S_{i+1} =$ `0`, let $x = A$.
        - If $S_i =$ `0` and $S_{i+1} =$ `1`, let $x = B$.
        - If $S_i =$ `1` and $S_{i+1} =$ `0`, let $x = C$.
        - If $S_i =$ `1` and $S_{i+1} =$ `1`, let $x = D$.
    3. Remove S_i and S_{i+1}, and insert the digit corresponding to x in their place. For example, if $S =$ `10101` and you choose $i = 2$, the string after the operation is `1001` if $B = 0$, and `1101` if $B = 1$.

You are given a string T of length N consisting of `0` and `1`.

- Let L be the length of the longest beautiful string that is a substring of T (if no substring of T is a beautiful string, let $L = -1$),
- Let M be the number of beautiful strings that are substrings of T.

Find L and M. Even if two substrings are identical as strings, count them separately if they are taken from different positions.

▶ What are substrings?

Constraints

- $1 \leq N \leq 2 \times 10^5$
- N is an integer.
- T is a string of length N consisting of `0` and `1`.

Input

The input is given from Standard Input in the following format:

```
N
T
```

Output

Print 16 lines. The i-th line should contain L and M separated by a space for (A, B, C, D) satisfying $i - 1 = 8A + 4B + 2C + D$.

Sample Input 1

Copy

Copy

```
3
110
```

Sample Output 1

Copy

Copy

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

We explain the case $(A, B, C, D) = (0, 0, 0, 1)$.
The string `11` obtained by taking the 1st through 2nd characters of T is a beautiful string, because if you choose $i = 1$ and perform the operation, the string becomes `1`.
In the case $(A, B, C, D) = (0, 0, 0, 1)$, the beautiful strings that are substrings of T are the following three strings:

- The string `1` obtained by taking the 1st character of T.
- The string `1` obtained by taking the 2nd character of T.
- The string `11` obtained by taking the 1st through 2nd characters of T.

Sample Input 2

Copy

Copy

```
4
0000
```

Sample Output 2

Copy

Copy

```
-1 0
-1 0
-1 0
-1 0
-1 0
-1 0
-1 0
-1 0
4 4
4 4
4 6
4 6
4 6
4 6
4 6
4 6
```

Sample Input 3

Copy

Copy

```
30
011011100101110111100010011010
```

Sample Output 3

Copy

Copy

```
1 17
4 31
29 263
29 280
29 232
29 247
30 240
30 447
30 418
29 225
30 435
30 435
30 435
30 435
30 439
30 452
```

'#telegram)

url=https%3A%2F%2Fatcoder.jp%2Fcontests%2Fabc418%2Ftasks%2Fabc418_g%3Flang%3Den&title=G%20-