Circular Palindromes

A *palindrome* is a string that reads the same from left to right as it does from right to left.

Given a string, S, of N lowercase English letters, we define a k*-length rotation* as cutting the first k characters from the beginning of S and appending them to the end of S. For each S, there are N possible k-length rotations (where $0 \leq k < N$). See the *Explanation* section for examples.

Given N and S, find all N k-length rotations of S; for each rotated string, S_k, print the maximum possible length of any palindromic substring of S_k on a new line.

Input Format

The first line contains an integer, N (the length of S).
The second line contains a single string, S.

Constraints

- $1 \leq N \leq 5 \times 10^5$
- $0 \leq k < N$
- S *is comprised of lowercase English letters.*

Output Format

There should be N lines of output, where each line k contains an integer denoting the maximum length of any palindromic substring of rotation S_k.

Sample Input 0

```
13
aaaaabbbbaaaa
```

Sample Output 0

```
12
12
10
8
8
9
11
13
11
9
8
8
10
```

Sample Input 1

```
7
cacbbba
```

Sample Output 1

```
3
3
3
3
3
3
3
```

Sample Input 2

```
12
eededdeedede
```

Sample Output 2

```
5
7
7
7
7
9
9
9
9
7
5
4
```

Explanation

Consider *Sample Case 1*, where $S = \text{"}\mathrm{cacbbba}\text{"}$.

The possible rotations, S_k, for string S are:
$S_0 = \text{"}\mathrm{cacbbba}\text{"}$.
$S_1 = \text{"}\mathrm{acbbba}\mathbf{c}\text{"}$
$S_2 = \text{"}\mathrm{cbbba}\mathbf{ca}\text{"}$
$S_3 = \text{"}\mathrm{bbba}\mathbf{cac}\text{"}$
$S_4 = \text{"}\mathrm{bba}\mathbf{cacb}\text{"}$
$S_5 = \text{"}\mathrm{ba}\mathbf{cacbb}\text{"}$
$S_6 = \text{"}\mathbf{acacbbb}\text{"}$

The longest palindromic substrings for each S_k are:
S_0: $\text{"}\mathbf{cac}\text{"}$ and $\text{"}\mathbf{bbb}\text{"}$, so we print their length (3) on a new line.
S_1: $\text{"}\mathbf{bbb}\text{"}$, so we print its length (3) on a new line.
S_2: $\text{"}\mathbf{bbb}\text{"}$ and $\text{"}\mathbf{aca}\text{"}$, so we print their length (3) on a new line.
S_3: $\text{"}\mathbf{bbb}\text{"}$, $\text{"}\mathbf{aca}\text{"}$, and $\text{"}\mathbf{cac}\text{"}$, so we print their length (3) on a new line.
S_4: $\text{"}\mathbf{aca}\text{"}$ and $\text{"}\mathbf{cac}\text{"}$, so we print their length (3) on a new line.
S_5: $\text{"}\mathbf{aca}\text{"}$ and $\text{"}\mathbf{cac}\text{"}$, so we print their length (3) on a new line.
S_6: $\text{"}\mathbf{aca}\text{"}$, $\text{"}\mathbf{cac}\text{"}$, and $\text{"}\mathbf{bbb}\text{"}$, so we print their length (3) on a new line.