

# Matching Palindrome

## Problem

You are given a [palindrome](#) string  $\mathbf{P}$  of length  $\mathbf{N}$  consisting of only lowercase letters of the English alphabet. Find the shortest non-empty palindrome string  $\mathbf{Q}$  such that  $\mathbf{P}$  concatenated with  $\mathbf{Q}$  forms a palindrome. Formally, the string  $\mathbf{PQ}$  forms a palindrome.

## Input

The first line of the input gives the number of test cases,  $\mathbf{T}$ .  $\mathbf{T}$  test cases follow. Each test case consists of two lines. The first line of each test case contains an integer  $\mathbf{N}$  denoting the length of the string  $\mathbf{P}$ . The second line of each test case contains a palindrome string  $\mathbf{P}$  of length  $\mathbf{N}$ .

## Output

For each test case, output one line containing `Case # $x$ :  $y$` , where  $x$  is the test case number (starting from 1) and  $y$  is the non-empty palindrome string  $\mathbf{Q}$  as described above.

## Limits

Memory limit: 1 GB.

$1 \leq \mathbf{T} \leq 100$ .

String  $\mathbf{P}$  is a palindrome consisting of only lowercase letters of the English alphabet.

### Test Set 1

Time limit: 20 seconds.

$1 \leq \mathbf{N} \leq 10^3$ .

### Test Set 2

Time limit: 40 seconds.

$1 \leq \mathbf{N} \leq 10^5$ .

## Sample

### Sample Input

```
3
4
abba
4
cccc
6
cdccdc
```

### Sample Output

```
Case #1: abba
Case #2: c
Case #3: cdc
```

In Case 1, the shortest palindrome string  $\mathbf{Q}$  is `abba` such that the concatenation  $\mathbf{PQ}$  is `abbaabba` which is a palindrome.

In Case 2, the shortest palindrome string  $Q$  is  $c$  such that the concatenation  $PQ$  is  $ccccc$  which is a palindrome.

In Case 3, the shortest palindrome string  $Q$  is  $cdc$  such that the concatenation  $PQ$  is  $cdccdc$  which is a palindrome.