Programming and Data Structures with Python 2025

Assignment 6

21 Nov 2025, due 30 Nov 2025

Find the longest palindrome

As we all know, a *palindrome* is a word that equals its reverse. Here are some examples of palindromes: `malayalam`, `gag`, `appa`, `amma`.

We consider any sequence consisting of the letters of the English alphabet to be a word. So `axxb`, `abbba` and `bbbccddx` are words for our purpose. And `aaabbaaa`, `abbba` and `bbb` are examples of palindromes.

By a *subword* of a word, we mean a contiguous subsequence of the word. For example the subwords of the word `abbba` are `a`, `b`, `ab`, `bb`, `ba`, `abb`, `bbb`, `bba`, `abbb`, `bbba` and `abbba`.

In this task you will given a word and you must find the longest subword of this word that is also a palindrome.

For example if the given word is `abbba` then the answer is `abbba`. If the given word is `abcbcabbacba` then the answer is `bcabbacb`.

Hint: If a subword u of w is a palindrome, what can you say about u and the reverse of w?

Input format

The first line of the input contains a single integer N indicating the length of the word. The following line contains a single word of length N, made up of the letters `a`, `b`, ..., `z`.

Output format

The first line of the output must contain a single integer indicating the length of the longest subword of the given word that is a palindrome. The second line must contain a subword that is a palindrome and which of maximum length. If there is more than one subword palindrome of maximum length, print the one that is lexicographically smallest (i.e., smallest in dictionary order).

Test Data

You may assume that $1 \le N \le 5000$.

Example

We illustrate the input and output format using the above examples:

Sample Input 1

```
5
abbba
```

Sample Output 1

```
5
abbba
```

Sample Input 2

```
12
abcbcabbacba
```

Sample Output 2

```
8
bcabbacb
```

Instructions

- Write a Python program that reads each input from the keyboard, solves the task and prints the solution to the screen, following the input and output format given above.

- Submit your solution through Moodle as a single Python notebook

- Add documentation to explain at a high level what your code is doing

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