ETH Zurich
Institut für Theoretische Informatik
Prof. Dr. Angelika Steger

HS 2015
Exercise Sheet 1

ACM Programming Challenges Lab

Exercise 1 – *Palindromes (hard version)*

Description A palindrome is a string such as "anna" or "rats live on no evil star" that reads the same both forwards and backwards.

Some strings are almost palindromes, for example "abcdba" is just one 'd' (or 'c') short of being a palindrome. Other strings, such as "abcdef" need many more characters added to them to be turned into a palindrome (5 in this case).

Your task in this exercise is to find the smallest number of letter insertions (at any position) which will turn a given string into a palindrome.

Input The input consists of several test-cases, one per line, and all non-empty lines of the input need to be processed. Each line contains one string. This string consists only of letters from the lower-case English alphabet.

Output For each string in the input print the minimum number of letter insertions needed to make it a palindrome on a single line. On the same line print all possible minimal palindromes in ascending alphabetical order

Sample input

```
a
nna
na
abc
rats
```

Sample output

```
0 a
1 anna
1 ana nan
2 abcba acbca cabac cbabc
3 rastsar ratstar rsatasr rstatsr sratars srtatrs starats strarts
```