Period

For each prefix of a given string ***S*** with ***N*** characters (each character has an ASCII code between 97 and 126, inclusive), we want to know whether the prefix is a periodic string. That is, for each ***i*** (2 <= ***i*** <= ***N***) we want to know the largest ***K*** > 1 (if there is one) such that the prefix of ***S*** with length ***i*** can be written as A^K , that is ***A*** concatenated ***K*** times, for some string ***A***. Of course, we also want to know the period ***K***.

Input

The first line of the input file will contains only the number *T (1 <= T <= 10)* of the test cases.

Each test case consists of two lines. The first one contains ***N*** (2 <= ***N*** <= 1 000 000) – the size of the string ***S***. The second line contains the string ***S***.

Output

For each test case, output “Test case #” and the consecutive test case number on a single line; then, for each prefix with length **i** that has a period **K** > 1, output the prefix size **i** and the period **K** separated by a single space; the prefix sizes must be in increasing order. Print a blank line after each test case.

Example

Input:
2
3
aaa
12
aabaabaabaab

Output:
Test case #1
2 2
3 3

Test case #2
2 2
6 2
9 3
12 4