

CS1020E: DATA STRUCTURES AND ALGORITHMS I

Lab 8 – Frequent Substring

(Week 12, starting 31 October 2016)

Problem Description

Write a program to find the most frequent substring of length **N** inside a (very) long string of length **L**.

For example, if **N** = 3, **L** = 9, and the string of length **L** is "baababacb", the most frequent substring is "aba" as it is of length 3 that appears most often (it appears twice) while the other 5 different substrings (i.e. "baa", "aab", "bab", "bac", "acb") appear only once.

Input

The first line of input contains an integer **TC** ($1 \leq \text{TC} \leq 10$) that denotes the number of test cases.

Then **TC** lines appear, one line for each test case.

Each test case (line) contains an integers **N** (details below), a space, an integer **L** ($1 \leq L \leq 1\,000\,000$), a space, and finally a string of strictly lowercase characters ['a'..'z'] of length **L**.

Output

For each test case, your program should print as output a line with the most frequent substring.

In case there are more than one substring with the highest frequency, output the substring that is lexicographically the smallest (see sample test case for clarity).

Subtask 1 – Most Frequent Character

70%

For this Subtask 1, **N** is always 1, i.e. you just need to output the most frequent character in the input string.

Input	Output
3	a
1 9 baababacb	b
1 10 bbbbbbcccc	a
1 10 aaaaabbbbb	

Submission

Your source file should be named `frequent1.cpp`

Problem 2 – Most Frequent Substring

30%

For this Subtask 2; $1 \leq N \leq 10$, i.e. you need to output the most frequent substring in the input string, including the most frequent character if N happens to be 1 for that test case.

Input	Output
6	a
1 9 baababacb	b
1 10 bbbbbbcccc	a
1 10 aaaaabbbbb	aba
3 9 baababacb	aaa
3 9 cccaaabbb	baababacb
9 9 baababacb	

Submission

Your source file should be named `frequent2.cpp`

- End of Lab 8 -