## Round A 2022 - Kick Start 2022

# Palindrome Free Strings

PROBLEM ANALYSIS

### Problem

You are given a string **S** consisting of characters 0, 1, and ?. You can replace each ? with either 0 or 1. Your task is to find if it is possible to assign each ? to either 0 or 1 such that the resulting string has no substrings that are palindromes of length 5 or more.

### Input

The first line of the input gives the number of test cases, T. T test cases follow.

Each test case consists of two lines.

The first line of each test case contains an integer N, denoting the length of the string S. The second line of each test case contains a string S of length 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 POSSIBLE if there is a possible resulting string that has no palindromic substrings of length 5 or more, or IMPOSSIBLE otherwise.

### Limits

Memory limit: 1 GB.

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

S only consists of characters 0, 1 and ?.

### Test Set 1

Time limit: 20 seconds.

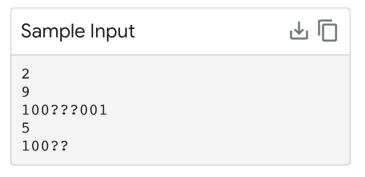
 $1 \le N \le 15$ .

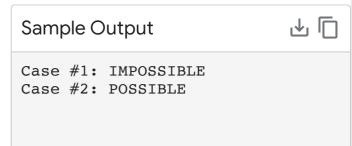
#### Test Set 2

Time limit: 90 seconds.

 $1 \le \mathbf{N} \le 5 \times 10^4.$ 

### Sample





In Sample Case #1, to prevent the whole string from being a palindrome, the first and last question mark must be different characters.

If we replace first question mark with 0 and replace the last question mark with 1, we get 1000? 1001. If the remaining ? is replaced by 1, we get 100011001, then the first 5 characters form a palindrome of length 5. Otherwise, we get 100001001, the first 6 characters are a palindrome of length 6.

If we replace first question mark with 1 we get 1001?0001. If the remaining ? is replaced by 1, we get 100110001, then the last 5 characters form a palindrome of length 5. Otherwise, we get 100100001, the last 6 characters are a palindrome of length 6.

Hence, there is no way to get a valid string.

In Sample Case #2, one of the valid strings after replacing all the ? is 10011.