

# 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.

$1 \leq T \leq 100$ .

$S$  only consists of characters 0, 1 and ?.

#### Test Set 1

Time limit: 20 seconds.

$1 \leq N \leq 15$ .

#### Test Set 2

Time limit: 90 seconds.

$1 \leq N \leq 5 \times 10^4$ .

## Sample

### Sample Input



```
2
9
100???001
5
100??
```

### Sample Output



```
Case #1: IMPOSSIBLE
Case #2: POSSIBLE
```

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.