Code Jam 2011 - Round 3

Mystery Square

Problem

I have written down a large perfect square in binary, and then replaced some of the digits with question marks. Can you figure out what my original number was?

Input

The first line of the input gives the number of test cases, **T**. **T** test cases follow, one per line. Each line contains **S**: a perfect square written in binary, but with some of the digits replaced by question marks.

Output

For each test case, output one line containing "Case #x: **N**", where x is the case number (starting from 1) and **N** is a perfect square written in binary, obtained by replacing each '?' character in **S** with either a '0' character or a '1' character.

Limits

1 ≤ **T** ≤ 25.
S begins with '1'.
S contains only the characters '0', '1', and '?'.
In every test case, there is exactly one possible choice for **N**.
Memory limit: 1GB.

Small dataset (Test set 1 - Visible)

S is at most 60 characters long.
S contains at most 20 '?' characters.
Time limit: 30 seconds.

Large dataset (Test set 2 - Hidden)

S is at most 125 characters long.
S contains at most 40 '?' characters.
Time limit: 60 seconds.

Sample

Sample Input

```
3
1???
1
10??110??00??1000??
```

Sample Output

```
Case #1: 1001
Case #2: 1
Case #3: 10111101100001000001
```