**Problem B. Googol String**

Problem

A "0/1 string" is a string in which every character is either 0 or 1. There are two operations that can be performed on a 0/1 string:

* **switch**: Every 0 becomes 1 and every 1 becomes 0. For example, "100" becomes "011".
* **reverse**: The string is reversed. For example, "100" becomes "001".

Consider this infinite sequence of 0/1 strings:  
  
S0 = ""  
  
S1 = "0"  
  
S2 = "001"  
  
S3 = "0010011"  
  
S4 = "001001100011011"  
  
...  
  
SN = SN-1 + "0" + **switch**(**reverse**(SN-1)).

You need to figure out the Kth character of Sgoogol, where googol = 10100.

Input

The first line of the input gives the number of test cases, **T**. Each of the next **T** lines contains a number **K**.

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 the **K**th character of Sgoogol.

Limits

1 ≤ **T** ≤ 100.

Small dataset

1 ≤ **K** ≤ 105.

Large dataset

1 ≤ **K** ≤ 1018.

Sample

|  |  |
| --- | --- |
| Input | Output |
| 4  1  2  3  10 | Case #1: 0  Case #2: 0  Case #3: 1  Case #4: 0 |