

Round E 2022 - Kick Start 2022

Coloring Game

PROBLEM

ANALYSIS

Problem

John loves to play computer games. He recently discovered an interesting game. In the game there are  $N$  cells, which are aligned in a row from left to right and are numbered with consecutive integers starting from 1. Initially, all cells are coloured *white*. A cell is valid if it has *white* color and it does not have any adjacent *red* colored cell. On each turn, a player paints any valid cell with the *red* color. The game ends when no valid cells are present. The score of the player is equal to the number of cells they paint.

To master the game, John is practicing against a bot. The bot is poorly trained and it always paints the first valid cell from the left. John on the other hand is playing the game very carefully and he can choose any valid cell. The bot makes the first move and the players take turns alternately.

Find the *maximum* achievable score by the bot, assuming that John is playing optimally to minimize the score of his opponent.

Input

The first line of the input gives the number of test cases,  $T$ .  $T$  test cases follow.  
The only line of each test case contains an integer  $N$  representing the number of cells in the game.

Output

For each test case, output one line containing Case # $xx$ :  $yy$ , where  $xx$  is the test case number (starting from 1) and  $yy$  is the *maximum* achievable score by the bot given that John is playing optimally.

Limits

Time limit: 20 seconds.  
Memory limit: 1 GB.

Test Set 1

$1 \leq T \leq 6$     $1 \leq N \leq 6$

Test Set 2

$1 \leq T \leq 100$     $1 \leq N \leq 10^6$

Sample

Sample Input	Sample Output
<pre>3 1 3 6</pre>	<pre>Case #1: 1 Case #2: 1 Case #3: 2</pre>

In Sample Case #1, there is  $N = 1$  cell. The maximum achievable score by the bot is 1.

- First move: The bot paints the first cell with red color.

Since there are no more possible moves, so the game ends. Thus, the answer is 1.

In Sample Case #2, there are  $N = 3$  cells. The maximum achievable score by the bot is 1.

First Move	<div>Bot</div>		
Second Move			John

- First move: The bot paints the first cell with red color.
- Second move: John paints the third cell with red color.

Since there are no more possible moves, so the game ends. Thus, the answer is 1.

In Sample Case #3, there are  $N = 6$  cells. The maximum achievable score by the bot is 2. In this sample, there exist multiple solutions, one of them would be:

First Move	<div>Bot</div>				
Second Move			John		
Third Move					Bot

- First move: The bot paints the first cell with red color.
- Second move: John paints the third cell with red color.
- Third move: The bot paints the fifth cell with red color.

Since there are no more possible moves, so the game ends. Thus, the answer is 2.