Problem D. Parentheses Order

Small input 10 points	Solve D-small
Large input 20 points	Solve D-large

Problem

An **n** parentheses sequence consists of **n** "("s and **n** ")"s.

A valid parentheses sequence is defined as the following:

You can find a way to repeat erasing adjacent pair of parentheses "()" until it becomes empty.

For example, "(())" is a valid parentheses, you can erase the pair on the 2nd and 3rd position and it becomes "()", then you can make it empty.
")()(" is not a valid parentheses, after you erase the pair on the 2nd and 3rd position, it becomes ")(" and you cannot erase any more.

Now, we have all valid **n** parentheses sequences. Find the **k**-th smallest sequence in lexicographical order.

For example, here are all valid 3 parentheses sequences in lexicographical order:

```
((()))

(()())

(())()

()(())

()()()
```

Input

The first line of the input gives the number of test cases, **T**. **T** lines follow. Each line represents a test case consisting of 2 integers, **n** and **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 smallest parentheses sequence in all valid **n** parentheses sequences. Output "Doesn't Exist!" when there are less than **k** different **n** parentheses sequences.

Limits

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

Small dataset

$1 \le \mathbf{n} \le 10$.
$1 \le \mathbf{k} \le 100000$.

Large dataset

$1 \le \mathbf{n} \le 100$.
$1 \le \mathbf{k} \le 10^{18}$.

Sample

```
Input     Output

3         Case #1: ()()
2 2       Case #2: (()())
3 4       Case #3: Doesn't Exist!
3 6
```