Google Code Jam '17 Qualification Round Problem C - Bathroom Stalls

Time limit: 60.0s **Memory limit:** 1G

A certain bathroom has $N+2$ stalls in a single row; the stalls on the left and right ends are permanently occupied by the bathroom guards. The other N stalls are for users.

Whenever someone enters the bathroom, they try to choose a stall that is as far from other people as possible. To avoid confusion, they follow deterministic rules: For each empty stall S, they compute two values L_S and R_S, each of which is the number of empty stalls between S and the closest occupied stall to the left or right, respectively. Then they consider the set of stalls with the farthest closest neighbor, that is, those S for which $\min(L_S, R_S)$ is maximal. If there is only one such stall, they choose it; otherwise, they choose the one among those where $\max(L_S, R_S)$ is maximal. If there are still multiple tied stalls, they choose the leftmost stall among those.

K people are about to enter the bathroom; each one will choose their stall before the next arrives. Nobody will ever leave.

When the last person chooses their stall S, what will the values of $\max(L_S, R_S)$ and $\min(L_S, R_S)$ be?

Input Specification

The first line of the input gives the number of test cases, T. T lines follow. Each line describes a test case with two integers N and K, as described above.

Output Specification

For each test case, output one line containing `Case #x: y z`, where x is the test case number (starting from 1), y is $\max(L_S, R_S)$, and z is $\min(L_S, R_S)$ as calculated by the last person to enter the bathroom for their chosen stall S.

Limits

$1 \le T \le 100$.

$1 \le K \le N$.

Time limit: 60 seconds per test set.

Memory limit: 1GB.

Small Dataset 1

$1 \le N \le 1\,000$.

Small Dataset 2

$1 \le N \le 10^6$.

Large Dataset

$1 \leq N \leq 10^{18}$.

Sample Input

```
5
4 2
5 2
6 2
1000 1000
1000 1
```

Sample Output

```
Case #1: 1 0
Case #2: 1 0
Case #3: 1 1
Case #4: 0 0
Case #5: 500 499
```

In Sample Case #1, the first person occupies the leftmost of the middle two stalls, leaving the following configuration (`O` stands for an occupied stall and `.` for an empty one): `O.O..O`. Then, the second and last person occupies the stall immediately to the right, leaving 1 empty stall on one side and none on the other.

In Sample Case #2, the first person occupies the middle stall, getting to `O..O..O`. Then, the second and last person occupies the leftmost stall.

In Sample Case #3, the first person occupies the leftmost of the two middle stalls, leaving `O..O...O`. The second person then occupies the middle of the three consecutive empty stalls.

In Sample Case #4, every stall is occupied at the end, no matter what the stall choices are.

In Sample Case #5, the first and only person chooses the leftmost middle stall.