7505 Hungry Game of Ants

It's time for a hungry game! But, don't worry — it's only for ants.

At the start of this hungry game, there are N ants on a stick of length $N+1$. The ants are numbered from 1 to N, and the i-th ant has a weight of i and stands i unit(s) from the left end of the stick. Note that the N-th ant is N units from the left end of the stick and 1 unit from the right end of the stick.

When the game begins, each ant selects left or right with equal probability and starts moving in that direction. All ants always move at the same speed throughout the game. Whenever an ant reaches either end of the stick, it will instantly change direction.

Whenever two ants meet, they fight, and the one with heavier weight wins. (If they are of equal weight, the one coming from the left wins.) Then, the winner eats the loser, which makes its weight permanently increase by the loser's weight. The winner then keeps moving in the direction it was moving before the fight. (This entire process happens instantly.)

The games continue until only one ant remains, and that ant is the winner!

Since each of the N ants can begin by moving left or right, there are 2^N possible scenarios. In how many of these scenarios will the K-th ant be the winner? Find this value *modulo* $1,000,000,007$ $(10^9 + 7)$.

Input

The first line of the input gives the number of test cases, T. T lines follow.

Each line consist of 2 integers N and K, the number of ants in this game and the index (starting from 1) of the ant we are interested in.

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 number of scenarios, modulo $1,000,000,007$ $(10^9 + 7)$, in which the K-th ant will be the winner.

Limits:

- $1 \le T \le 100$.
- $1 \le K \le N$.
- $2 \le N \le 10^6$.

Note:

In Case #1, there are 2 ants. No matter what directions they go in initially, they will meet and Ant #2 will eat Ant #1. So it is impossible for Ant #1 to be the winner.

In Case #2, there are 3 ants. In any scenario in which Ant #2 initially moves left, it will first encounter and eat Ant #1, increasing its weight to 3. Then it will encounter Ant #3; it will have the same weight as Ant #3, but Ant #2 will win because it is coming from the left. However, in any scenario in which Ant #2 initially moves right, it will first encounter Ant #3 and will be eaten. Since there are 8 scenarios, and Ant #2 initially moves left in half of them, the answer is 4.

Sample Input

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3
2 1
3 2
4 2
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Sample Output

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Case #1: 0
Case #2: 4
Case #3: 4
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