Highway Construction

BEFORE : You are the planner for the next FIFA World Cup and you are counting the number of highways that needs to be built to connect the cities with the venues.
Your country has n cities, each named “Highway City 1”, “Highway City 2”, $\cdots$ “Highway City n”. All the cities lie on a single straight road called “Highway Road”. If somebody wants to go from City x to City y (where $x \leq y$), he needs to go through city $x, x+1, x+2, \cdots, y-1, y$.

TODO Note: We need to double check the statement after having removed some unnecessary detail. The requirements for the highways are as follows:

1. All games will be held in "Highway City n".
2. New bidirectional roads, called *"Super Highways"*, need to be built such that it is possible to visit “Highway City n” from any other city directly.

You also have to find how much it will cost to fulfil the second condition. The engineering team knows that if the length of a Super Highway is l, then it will cost l^k, where k is an integer constant that they found from research. The length of Super Highway between city x and y is $|x-y|$.

For this challenge you just need to find a rough estimation of the cost, so instead of the exact cost, find Total Cost Modulo 1000000009.

AFTER : You are planning the next FIFA World Cup and you are counting the number of highways that need to be built to connect the cities with the venues.
Your country has n cities and all cities lie on a single straight road called “Highway Road”. If somebody wants to go from City x to City y (where $x \leq y$), he needs to go through city $x, x+1, x+2, \cdots, y-1, y$.

The requirements for the highways are as follows:

1. All games will be held in the 'nth' city.
2. New bidirectional roads, called *"Super Highways"*, need to be built such that it is possible to visit the nth city from any other city directly.

You also have the cost in rupees, to fulfil the second condition. The engineering team knows that if the length of a Super Highway is l, then it will cost l^k, where k is an integer constant.The length of Super Highway between city x and y is $|x-y|$.

For this problem, you need to find only a rough estimation of the cost, hence, find Total Cost Modulo 1000000009.

Input Format

First line will contain a single positive integer q ($q \leq 200$) denoting the number of queries. Then for each case there will be two positive integers, n and k.

Constraints

- $1 \leq q \leq 200$
- $1 \leq n \leq 10^{18}$
- $1 \leq k \leq 1000$

Output Format

For each case print a single positive integer which is the cost to build Super Highways between each city

to n, Modulo 1000000009.

Sample Input 0

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1
4 2
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Sample Output 0

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13
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Explanation 0

There are four cities. We need to build Super Highways that connect city 1 to city 4 and city 2 to city 4. No need to connect city 3 with city 4 since they are adjacent on “Highway Road”. So cost is $(4-1)^2 + (4-2)^2 = 3^2 + 2^2 = 13$.