

# Swap (Easy - Level 2)

Let's play with sequence of non negative integer. Given two sequence of  $n$  non negative integers  $(a_1, a_2 \dots a_n)$  and  $(b_1, b_2 \dots b_n)$ . Both sequence has maximum element less than  $k$ ,  $\max(a_1, a_2 \dots a_n) < k$  and  $\max(b_1, b_2 \dots b_n) < k$ . The game rule is you can edit both sequence with this operation: swap  $a_i$  and  $b_i$  with  $1 \leq i \leq n$ , and the goal is to make sequence  $\mathbf{a}$  and  $\mathbf{b}$  become increasing sequence:  $a_i \leq a_j$  if and only if  $i \leq j$  and  $b_i \leq b_j$  if and only if  $i \leq j$ . But not all initial sequence  $\mathbf{a}$  and  $\mathbf{b}$  can be solved.

For example  $(2, 0)$  and  $(0, 1)$  is a pair of sequence that can't be solved:

- If you don't swap any element, you have  $(2, 0)$  and  $(0, 1)$ , but sequence  $(2, 0)$  is not increasing.
- If you swap first element only, then the pair become like this  $(0, 0)$  and  $(2, 1)$ , sequence  $(2, 1)$  is not increasing.
- If you swap second element only, then the pair become like this  $(2, 1)$  and  $(0, 0)$ , again  $(2, 1)$  is not increasing.
- If you swap both element, then the pair become like this  $(0, 1)$  and  $(2, 0)$ , again  $(2, 0)$  is not increasing

So it's impossible to solve if initial sequence is  $(2, 0)$  and  $(0, 1)$ , because all possible move can't make both sequence become increasing.

Now given  $n$  and  $k$ , your task is to compute number of different pair of initial sequence  $(\mathbf{a}, \mathbf{b})$  that can be solved with game described above.

## Input

First line there is an integer  $T$  denoting number of test case, then  $T$  test cases follow.

For each case, there are two integers  $n$  and  $k$  written in one line, separated by a space.

## Output

For each case, output number of different pair of initial sequence  $(\mathbf{a}, \mathbf{b})$ , since the answer can be large, output the answer modulo  $10^9+7$ .

## Constraints

$$0 < T \leq 10^5$$

$$0 < \min(n, k) \leq 2$$

$$0 < \max(n, k) < 10^9$$

## Example

Input:

6

2 1  
1 2  
1 3  
2 2  
3 2  
2 3

**Output:**

1  
4  
9  
11  
26  
46

**Explanation**

Here is list of all possible pair of initial sequence (**a**, **b**) on each case:

Case 1:  $\{(0, 0), (0, 0)\}$

Case 2:  $\{(0, (0)), (0, (1)), ((1), (0)), ((1), (1))\}$

Case 3:  $\{(0, (0)), (0, (1)), (0, (2)), ((1), (0)), ((1), (1)), ((1), (2)), ((2), (0)), ((2), (1)), ((2), (2))\}$

Case 4:  $\{(0, 0), (0, 0), [(0, 0), (0, 1)], [(0, 0), (1, 1)], [(0, 1), (0, 0)], [(0, 1), (0, 1)], [(0, 1), (1, 0)], [(0, 1), (1, 1)], [(1, 0), (0, 1)], [(1, 1), (0, 0)], [(1, 1), (0, 1)], [(1, 1), (1, 1)]\}$

Case 5:  $\{(0, 0, 0), (0, 0, 0), [(0, 0, 0), (0, 0, 1)], [(0, 0, 0), (0, 1, 1)], [(0, 0, 0), (1, 1, 1)], [(0, 0, 1), (0, 0, 0)], [(0, 0, 1), (0, 0, 1)], [(0, 0, 1), (0, 1, 0)], [(0, 0, 1), (0, 1, 1)], [(0, 0, 1), (1, 1, 0)], [(0, 0, 1), (1, 1, 1)], [(0, 1, 0), (0, 0, 1)], [(0, 1, 0), (1, 0, 1)], [(0, 1, 1), (0, 0, 0)], [(0, 1, 1), (0, 0, 1)], [(0, 1, 1), (0, 1, 1)], [(0, 1, 1), (1, 0, 0)], [(0, 1, 1), (1, 0, 1)], [(0, 1, 1), (1, 1, 1)], [(1, 0, 0), (0, 1, 1)], [(1, 0, 1), (0, 1, 0)], [(1, 0, 1), (0, 1, 1)], [(1, 1, 0), (0, 0, 1)], [(1, 1, 1), (0, 0, 0)], [(1, 1, 1), (0, 0, 1)], [(1, 1, 1), (0, 1, 1)], [(1, 1, 1), (1, 1, 1)]\}$

Case 6:  $\{(0, 0), (0, 0), [(0, 0), (0, 1)], [(0, 0), (0, 2)], [(0, 0), (1, 1)], [(0, 0), (1, 2)], [(0, 0), (2, 2)], [(0, 1), (0, 0)], [(0, 1), (0, 1)], [(0, 1), (0, 2)], [(0, 1), (1, 0)], [(0, 1), (1, 1)], [(0, 1), (1, 2)], [(0, 1), (2, 2)], [(0, 2), (0, 0)], [(0, 2), (0, 1)], [(0, 2), (0, 2)], [(0, 2), (1, 0)], [(0, 2), (1, 1)], [(0, 2), (1, 2)], [(0, 2), (2, 0)], [(0, 2), (2, 1)], [(0, 2), (2, 2)], [(1, 0), (0, 1)], [(1, 0), (0, 2)], [(1, 1), (0, 0)], [(1, 1), (0, 1)], [(1, 1), (0, 2)], [(1, 1), (1, 1)], [(1, 1), (1, 2)], [(1, 1), (2, 2)], [(1, 2), (0, 0)], [(1, 2), (0, 1)], [(1, 2), (0, 2)], [(1, 2), (1, 1)], [(1, 2), (1, 2)], [(1, 2), (2, 1)], [(1, 2), (2, 2)], [(2, 0), (0, 2)], [(2, 1), (0, 2)], [(2, 1), (1, 2)], [(2, 2), (0, 0)], [(2, 2), (0, 1)], [(2, 2), (0, 2)], [(2, 2), (1, 1)], [(2, 2), (1, 2)], [(2, 2), (2, 2)]\}$

**Other Info**

Test case (**n** and **k**) is generated randomly using this rule:

- Probability that  $n > k$  or  $n \leq k$  is ~50% each.
- Maximum **n** and **k** is random log-uniform.
- Minimum **n** and **k** is random uniform.

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*Time limit > 100× my program top speed.*

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**See also:** [Another problem added by Tjandra Satria Gunawan](#)