

Problem H. Quicksort

Input file: *standard input*
Output file: *standard output*
Time limit: 2 seconds
Memory limit: 512 mebibytes

Bob has written a fake QuickSort implementation as below. Can you figure out, if he randomly chooses a permutation $p = [p_1, p_2, \dots, p_n]$ obtained from $1, 2, \dots, n$ with equal probability, the expected number of inversions of p after calling `QuickSort(p, 1, n, k)`?

Functions 1 — a fake QuickSort implementation

```
1: function QUICKSORT( $A, l, r, h$ ) ▷ Elements in  $A$  would be modified
2:   if  $h > 1$  and  $l < r$  then
3:      $m \leftarrow$  PARTITION( $A, l, r$ )
4:     QUICKSORT( $A, l, m - 1, h - 1$ )
5:     QUICKSORT( $A, m + 1, r, h - 1$ )
6: function PARTITION( $A, l, r$ ) ▷ Elements in  $A$  would be modified
7:    $i \leftarrow l$ 
8:    $j \leftarrow r$ 
9:    $m \leftarrow \lfloor \frac{l+r}{2} \rfloor$ 
10:   $pivot \leftarrow A_m$ 
11:   $A_m \leftarrow A_i$ 
12:  while  $i < j$  do
13:    while  $i < j$  and  $A_j \geq pivot$  do
14:       $j \leftarrow j - 1$ 
15:    if  $i < j$  then
16:       $A_i \leftarrow A_j$ 
17:    while  $i < j$  and  $A_i < pivot$  do
18:       $i \leftarrow i + 1$ 
19:    if  $i < j$  then
20:       $A_j \leftarrow A_i$ 
21:   $A_i \leftarrow pivot$ 
22:  return  $i$ 
```

The number of inversions of a permutation $[p_1, p_2, \dots, p_n]$ is the number of integer pairs (u, v) such that $1 \leq u < v \leq n$ and $p_u > p_v$.

To avoid any precision issue, you are asked to report the product of $n!$, the factorial of n , and the expected number in modulo 998244353, which ought to be an integer.

Input

The input contains several test cases. The first line contains an integer T indicating the number of test cases. The following describes all test cases. For each test case:

The only line contains two integers n and k .

- $1 \leq T \leq 3 \times 10^5$
- $1 \leq n, k \leq 6000$

Output

For each test case, output a line containing “Case #x: y” (without quotes), where x is the test case number starting from 1, and y is the answer to this test case.

Example

standard input	standard output
5	Case #1: 600
5 1	Case #2: 240
5 2	Case #3: 64
5 3	Case #4: 8
5 4	Case #5: 0
5 5	