2D arrays with XOR property

We consider 2D arrays A, (0,0)-indexed, shape $N \times M$.
With $0 \leq i < N$ and $0 \leq j < M$, we have $0 < A_{i,j} \leq N \times M$.
Our interest will be to count those arrays that have the two properties :

- Arrays A are composed with **all** numbers from 1 to $N \times M$.
  i.e. we have $(i, j) \neq (k, l) \implies A_{i,j} \neq A_{k,l}$
- $(i \oplus j) > (k \oplus l) \implies A_{i,j} > A_{k,l}$, where $\oplus$ denotes bitwise XOR.

Input

The first line contains T, the number of test cases, and P a prime number.

Each of the next T lines contains N and M, the shape of the arrays A.

Output

For each test case, print the number of arrays A with the given properties.
As the result may be large, the answer **modulo** P is required.

Example

Input:
2 1000000007
2 2
997 799

Output:
4
828630475

For the first case, the 4 possible 2x2 arrays are : $\binom{1\,3}{4\,2}$, $\binom{1\,4}{3\,2}$, $\binom{2\,3}{4\,1}$, and $\binom{2\,4}{3\,1}$.

Constraints

$1 \leq T \leq 10^4$,
$10^9 < P < 2 \times 10^9$, a prime number,
$1 \leq N \leq 10^9$,
$1 \leq M \leq 10^5$.

Constraints allow a small kB of unoptimized PY3.4 code to get AC in the third of the TL. **Have fun.**