Factorial Modulo Prime

Find $N!$ **modulo** P.

Input

The first line contains T ($1 \le T \le 100,000$), the number of test cases.

Each of the next T lines contains two integers N ($0 \le N \le 10^{11}$) and P ($2 \le P \le 10^{11}$), where P is a prime.

Output

For each N and P, output $N!$ **modulo** P.

Constraints

For each input file, It is guaranteed that (the sum of $\sqrt{P}) \le 320000$.

Example

Input

```
3
1000 9907
1000000 9999907
10000000000 99999999907
```

Output

```
4494
3354924
40583077821
```

Note

- Probably, $O(P)$ solutions will not pass.
- My solution runs in 0.5 seconds for each input file.