[D4] The Modular Zeroes (750 pts)

Time Limit: 1s
Memory Limit: 512MB

Problem Description

Figure 1: The Vault of Fort Knox

"`How many zeroes?`" The AI system of Fort Knox, Gustov Macintlog, asks Inspector Mont. Mont Blanc just scratches is head and replies, "Not sure what you mean, Monsieur Gustov; this state-of-the-art security system is very complex!" The security system for the Fort Knox vault has N combination locks, each having M numerals on the dial numbering from 0 to $M-1$. These locks may seem extremely important at first but they are actually just hints to the true nature of the vault. The true way to get into the vault is by talking to the AI system, Gustov Macintlog, and giving the correct answer to his question.

You jump back to the middle of your conversation with Macintlog. "To put it simply", Mont adds, "adding a $N+1^{th}$ lock will increase the complexity of the system by $N+1$ times! It does not matter how many numbers you have on the dial; and it starts with a complexity 1 for a one-lock system. So if you have locks with 3-numbered dials, adding a second and a third lock will have the resulting complexity be 6 since $1 \times 2 \times 3 = 6$"

AI Gustov: "`How many zeroes...at the end?`"

Mont Blanc: "... In the example I just gave you, none. The complexity of 6 does not have any zeroes at the end"

AI Gustov: "`Incorrect`"

Mont Blanc: "Wait, i remember something from reading your manual. You speak in base-M right? In that case, since the dials have 3 numbers, doesn't 6 become 20?

AI Gustov: "`Correct`"

Mont Blanc: "Then that has 1 trailing zero, gotcha!"

AI Gustov: "`Correct`"

The vault finally opens.

Given N and M, the complexity C of the system would be $1 \times 2 \times \cdots \times N$. If C is represented as a base-M number, how many *trailing zeroes* would there be?

Input Specification

Input will begin with an integer T denoting the number of test cases. T test cases follow, each in one line.

The i^{th} test case is composed of two space-separated integers N and M, both represented in base-10. These denote the number of combination locks in the system, and the number of numerals on each lock respectively.

Output Specification

For each test case, output an integer in base-10, denoting the number of trailing zeroes in the base-M_i representation of the complexity C_i of the system containing N_i locks.

Constraints

$1 \leq T \leq 10^4$
$1 \leq N \leq 10^{15}$
$2 \leq M \leq 10^9$

Sample Input

```
4
3 3
10 2
69 12
734206856189756 848279527
```

Sample Output

```
1
8
32
865524
```