Self Descriptive Number

A positive integer *m* is called "self-descriptive" in base *b*, where $b \geq 2$ and *b* is an integer, if:

i) The representation of *m* in base *b* is of the form $(a_0a_1...a_{b-1})_b$

(that is $m=a_0b^{b-1}+a_1b^{b-2}+...+a_{b-2}b+a_{b-1}$, where $0 \leq a_i \leq b-1$ are integer)

ii) a_i is equal to the number of occurrences of number i in the sequence $(a_0a_1...a_{b-1})$.

For example, $(21200)_5$ is "self-descriptive" in base 5, because it has five digits and contains two 0s, one 1s, two 2s, and no (3s or 4s).

$(21200)_5 = (1425)_{10}$ so 1425 is "self-descriptive" number.

Given **n** ($1 \leq$ **n** $\leq 10^{18}$) and **m** ($1 \leq$ **m** $\leq 10^9$), your task is to find the **n**-th smallest "self-descriptive" number.

Input

The first line there is an integer **T** ($1 \leq$ **T** $\leq 10^5$).

For each test case there are two integers **n** and **m** written in one line, separated by a space.

Output

For each test case, output the **n**-th smallest "self-descriptive" number, (output the number in base 10) modulo **m**.

Example

Input:
2
1 1000
2 1000

Output:
100
136

Explanation

100 is "self descriptive" number in base 4: $(1210)_4$

136 is "self descriptive" number in base 4: $(2020)_4$

Time limit ~230x My program speed: [Click here to see my submission history and time record for this problem]

See also: [Another problem added by Tjandra Satria Gunawan]