An anti-arithmetic sequence is one in which no subsequence of length p does form an arithmetic sequence. An arithmetic sequence is a sequence of numbers such that the difference of any two successive members of the sequence is a constant. For instance, the sequence 3, 5, 7, 9, 11, 13 ... is an arithmetic progression with common difference 2. Now for a given p an infinite anti-arithmetic sequence is built in the following way.

- The sequence will contain only positive numbers and strictly increasing.
- The first $p-1$ numbers of the sequence is $1, 2, \ldots, p-1$. After that each time the smallest number is added to the sequence so that no subsequence of length p forms an arithmetic sequence. For $p = 3$ the infinite sequence is 1, 2 , 4, 5, 10, 11, 13, 14, 28, 29 and so on.

Your task is to given p and n find the nth value of the anti-arithmetic sequence.

Input

First line of the input contains an integer T ($1 \leq T \leq 1000$) which denotes the number of test cases. Then each of the following T lines contains one test case. Each case contains 2 integers n ($1 \leq n \leq 2 * 10^{10}$) and p ($3 \leq p \leq 30$), and p is always a prime number.

Output

For each test case output contains 1 number indicating the nth value of the anti arithmetic sequence of p. This value will always fit into 64-bit signed integer.

Sample Input

```
3
10 3
10 5
100 7
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Sample Output

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29
12
130
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