

7271 A Math Problem

Stan is crazy about math. One day, he was confronted with an interesting integer function defined on positive integers, which satisfies $f(1) = 1$ and for every positive integer n , $3 \times f(n) \times f(2n + 1) = f(2n) \times (1 + 3f(n))$, $f(2n) < 6 \times f(n)$.

He wanted to know, in the range of 1 to n , for a given k , what are $f(i) \bmod k$ like. For simplicity, you could just calculate the number of i which satisfies $f(i) \bmod k = t$ for every t in range of 0 to $k-1$ as $g(t)$, and tell Stan what is all $g(x)$ xor up is.

Input

There are no more than 40 test cases.

The first line of the input contains an integer T which means the number of test cases.

Each test case contains two integer, n, k , just as mentioned earlier. Please note that $n \leq 10^{18}$, and k is a known Fermat prime — that is to say, k is among $\{3, 5, 17, 257, 65537\}$.

Output

For each test case, output the result of all $g(x)$ xor up.

Sample Input

```
2
1 3
5 5
```

Sample Output

```
1
3
```