Grade 2

Input file:	`standard input`
Output file:	`standard output`
Time limit:	3 seconds
Memory limit:	256 megabytes

Kotsuki the Cat, together with FuuFuu and Pico, lives in the KFP apartment. As a teacher, Kotsuki needs to go to school every day to give lessons. One day, Kotsuki gives a math lesson to some grade 2 students in primary school, covering the following topics:

- Coprime: Two integers are coprime if the only positive integer that is a divisor of both of them is 1.
- Bitwise XOR ($\oplus$): Bitwise XOR is a binary operation that takes two integers and performs the logical exclusive OR operation on each pair of corresponding bits of their binary forms. The result in each will be 1 if only one of the bits is 1, but will be 0 if both are 0 or both are 1. For example, $5 \oplus 3 = (101)_2 \oplus (011)_2 = (110)_2 = 6$.

After class, Kotsuki assigns homework to the students:

- Given an integer x, for different intervals $[l, r]$, please calculate the number of integers k within the interval satisfying $kx \oplus x$ and x are coprime. Formally, please calculate

$$\sum_{k=l}^{r} [\gcd(kx \oplus x, x) = 1]$$

where $\gcd(a, b)$ denotes the greatest common divisor of a and b, and $[\,]$ denotes the Iverson bracket $[P] = \begin{cases} 1 & \text{if } P \text{ is true} \\ 0 & \text{otherwise} \end{cases}$. Specially, $\gcd(0, a) = a$.

Can you solve this grade 2 homework?

Input

The first line contains two integers x ($1 \le x \le 10^6$) and n ($1 \le n \le 10^5$), where n indicates the number of intervals.

Each of the following n lines contains two integers l and r ($1 \le l \le r \le 10^{12}$), indicating an interval $[l, r]$.

Output

For each interval, output the answer in a single line.

Example

standard input	standard output
15 2 1 4 11 4514	2 2252

Note

When $x = 15$,

- $k = 1$, $\gcd(kx \oplus x, x) = \gcd(15 \oplus 15, 15) = \gcd(0, 15) = 15$
- $k = 2$, $\gcd(kx \oplus x, x) = \gcd(30 \oplus 15, 15) = \gcd(17, 15) = 1$
- $k = 3$, $\gcd(kx \oplus x, x) = \gcd(45 \oplus 15, 15) = \gcd(34, 15) = 1$
- $k = 4$, $\gcd(kx \oplus x, x) = \gcd(60 \oplus 15, 15) = \gcd(51, 15) = 3$

So the answer to interval $[1, 4]$ is 2.