Giga-xor

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	256 megabytes

An interval $[a, b]$ is a giga-xor interval if and only if the xor sum of the natural numbers inside the interval $[a, b]$ is equal to 0, where a and b are natural numbers.

Strictly speaking, an interval $[a, b]$ is giga-xor if and only if $a \oplus (a + 1) \oplus (a + 2)... \oplus \ b = 0$.

You are given T pairs of numbers (a, b). For each pair, you need to find the length of the shortest interval $[x, y]$ such that $1 <= x <= a <= b <= y$ and $[x, y]$ is a giga-xor interval.

Input

The first line contains T ($1 \leq T \leq 5 * 10^5$), the number of pairs.

On the following T lines, there are 2 integers a, b ($1 \leq a \leq b \leq 10^{18}$).

For tests worth 10 points, $b \leq 100$

For tests worth 30 more points, $b \leq 10^6$

Output

Print on T lines, the answer for each pair.

Example

standard input	standard output
5 4 5 2 3 1 7 8 8 1 10	4 3 7 4 11