Long Binary String

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

A long binary string is formed via the following process:

1. Start with the string `1`.

2. Every second, we replace each `1` of the current string with `10` and each `0` of the current string with `1`.

The state of the string in the first few seconds is as follows: $1, 10, 101, 10110, 10110101$.

Let s be the string obtained at the end of the process after running it for 10^{100} seconds. You want to answer Q queries of the following type: how many ones are there between the l-th character and r-th character (inclusive) of s?

Input

The first line contains a single integer Q ($1 \leq Q \leq 300\,000$), denoting the number of queries.

The next Q lines each contain two space-separated integers l, r ($1 \leq l \leq r \leq 10^{18}$), representing the queries.

Output

For each query, output the number of ones between the l-th character and r-th character (inclusive) of s.

Scoring

Subtask 1 (7 points): $Q = 1$, $r \leq 300\,000$

Subtask 2 (10 points): $l = 1$, $r \leq 300\,000$

Subtask 3 (13 points): $r \leq 300\,000$

Subtask 4 (20 points): $l = 1$, r is equal to the length of the string after some integer number of seconds.

Subtask 5 (15 points): $l = r$

Subtask 6 (15 points): $Q = 1$

Subtask 7 (10 points): $r \leq 10^9$

Subtask 8 (10 points): No additional constraints

Example

standard input	standard output
3 3 9 6 6 1 12	5 1 8

Note

One can show that the first 12 characters of the string are 101101011011.

For the first query, there are 5 ones between the 3rd character and 9th character. The relevant substring is 1101011.

For the second query, there is 1 one between the 6th character and 6th character. The relevant substring is 1.

For the third query, there are 8 ones between the 1st character and 12th character. The relevant substring is 101101011011.