Infinite Binary Tree

Consider the infinite complete binary tree in which the root is labelled 1, and each node labelled i has two children, labeled $2i$ and $2i + 1$. Thus, the parent of the node labelled i is $\lfloor i/2 \rfloor$. You come across such binary trees (in the finite form) while implementing heaps etc.

In this you problem, are given the labels of two nodes in this infinite binary tree. You have to find the distance between the two nodes—the distance is the number of edges in the path connecting the two nodes. You have to answer a set of Q queries of this form.

Input format

- The first line consists of the integer Q: the number of queries.

- Each of the next Q lines consists of two numbers u and v, denoting the labels of the two nodes of a query. The numbers u and v can be large (larger than what the `long long` datatype can hold): You have to input the numbers as strings (see the constraints for Subtasks 3 and 4).

Output format

Your output should consist of Q lines of output, each containing a single integer. For $1 \leq i \leq Q$, the integer in line i should be the the distance between the two nodes specified in query i.

Test data

- Subtask 1 (20 marks) : $Q \leq 100$, $1 \leq u, v \leq 100,000$.
- Subtask 2 (20 marks) : $Q \leq 20,000$, $u, v \leq 1,000,000$.
- Subtask 3 (30 marks) : $Q \leq 1,000$, $u, v < 10^{36}$.
- Subtask 4 (30 marks) : $Q \leq 20,000$, $u, v < 10^{36}$.

Sample input

```
3
4 5
262144 262143
1000000 1000000
```

Sample output

```
2
35
0
```

Limits

- *Memory limit* : 128 MB
- *Time limit* : 5s