Count Periodic Numbers

Problem Statement

A positive integer n is said to be **periodic** if it satisfies the following property:

Take the binary representation of n without leading zeros. Then create an array which contains the length of consecutive runs of equal bits in this binary representation. All the elements of this array should be equal. If there are two unequal elements in this array, then n is **not periodic**.

Examples

- Suppose $n = 3$. Its binary representation is 11. The array created would be $\{2\}$, which corresponds to the fact that there are two equal bits at the beginning. This is periodic.
- Suppose $n = 51$. Its binary representation is 110011. The array created would be $\{2, 2, 2\}$, which corresponds to the fact that there are two equal bits at the beginning, then the next two are equal, and then the next two are equal. This is also periodic.
- Suppose $n = 103$. Its binary representation is 1100111. The array created would be $\{2, 2, 3\}$, which corresponds to the fact that there are two equal bits at the beginning, then the next two are equal, and then the next three are equal. This is **not periodic** because the array contains two different values (2 and 3).

You are given two integers L, R. Find the number of integers in the range $[L, R]$ (both inclusive) that are periodic.

Input Format

- The first line of the input contains an integer T denoting the number of test cases.
- Each test case consists of one line containing two space-separated integers L, R.

Output Format

For each test case, output a single line containing an integer corresponding to the number of periodic numbers in the range $[L, R]$.

Constraints

- $1 \leq T \leq 10^5$
- $1 \leq L, R \leq 10^9$

Example Input

```
2
3 3
1 10
```

Example Output

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1
6
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Explanation

Testcase 1: The only number between L and R is 3, which is periodic. Hence the answer is 1.

Testcase 2: The periodic numbers between 1 and 10 are $1, 2, 3, 5, 7, 10$. Since there are six of them, the answer is 6.