6268. Cycle Length Queries in a Tree

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You are given an integer `n`. There is a **complete binary tree** with $2^n - 1$ nodes. The root of that tree is the node with the value `1`, and every node with a value `val` in the range $[1, 2^{n-1} - 1]$ has two children where:

- The left node has the value `2 * val`, and
- The right node has the value `2 * val + 1`.

You are also given a 2D integer array `queries` of length `m`, where `queries[i] = [a_i, b_i]`. For each query, solve the following problem:

1. Add an edge between the nodes with values a_i and b_i.
2. Find the length of the cycle in the graph.
3. Remove the added edge between nodes with values a_i and b_i.

Note that:

- A **cycle** is a path that starts and ends at the same node, and each edge in the path is visited only once.
- The length of a cycle is the number of edges visited in the cycle.
- There could be multiple edges between two nodes in the tree after adding the edge of the query.

Return *an array* `answer` *of length* `m` *where* `answer[i]` *is the answer to the* i^{th} *query.*

User Accepted:	0
User Tried:	0
Total Accepted:	0
Total Submissions:	0
Difficulty:	Hard

Example 1:
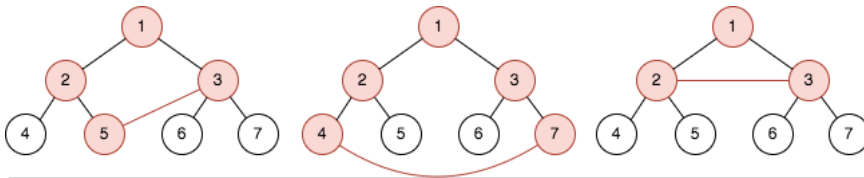

```
Input: n = 3, queries = [[5,3],[4,7],[2,3]]
Output: [4,5,3]
Explanation: The diagrams above show the tree of 2³ − 1 nodes. Nodes colored in red describe the nodes in the cycle after adding
– After adding the edge between nodes 3 and 5, the graph contains a cycle of nodes [5,2,1,3]. Thus answer to the first query is
– After adding the edge between nodes 4 and 7, the graph contains a cycle of nodes [4,2,1,3,7]. Thus answer to the second query
– After adding the edge between nodes 2 and 3, the graph contains a cycle of nodes [2,1,3]. Thus answer to the third query is 3
```
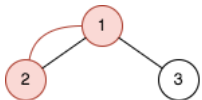
Example 2:


```
Input: n = 2, queries = [[1,2]]
Output: [2]
Explanation: The diagram above shows the tree of 2² − 1 nodes. Nodes colored in red describe the nodes in the cycle after adding
– After adding the edge between nodes 1 and 2, the graph contains a cycle of nodes [2,1]. Thus answer for the first query is 2.
```

Constraints:

- `2 <= n <= 30`
- `m == queries.length`
- $1 <= m <= 10^5$
- `queries[i].length == 2`
- $1 <= a_i, b_i <= 2^n - 1$
- $a_i != b_i$

JavaScript ▼   🔲   ⟳   ⚙

```
1 ▾ const cycleLengthQueries = (n, queries) => {
```

```
 2        let res = [];
 3 ▾      for (let [u, v] of queries) {
 4            let cnt = 1;
 5 ▾          while (u != v) {
 6                u > v ? u >>= 1 : v >>= 1;
 7                cnt++;
 8            }
 9            res.push(cnt);
10        }
11        return res;
12    };
```

☐ **Custom Testcase**   (Use Example Testcases)

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