Problem 1627: Graph Connectivity With Threshold

Problem Information

Difficulty: Hard
Acceptance Rate: 48.96%
Paid Only: No
Tags: Array, Math, Union Find, Number Theory

Problem Description

We have `n` cities labeled from `1` to `n`. Two different cities with labels `x` and `y` are directly connected by a bidirectional road if and only if `x` and `y` share a common divisor **strictly greater** than some `threshold`. More formally, cities with labels `x` and `y` have a road between them if there exists an integer `z` such that all of the following are true:

* `x % z == 0`, * `y % z == 0`, and * `z > threshold`.

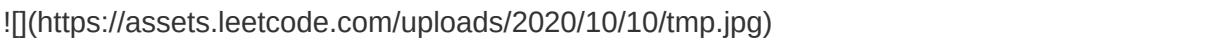
Given the two integers, `n` and `threshold`, and an array of `queries`, you must determine for each `queries[i] = [ai, bi]` if cities `ai` and `bi` are connected directly or indirectly. (i.e. there is some path between them).

Return _an array_`answer` _, where_`answer.length == queries.length` _and_`answer[i]`_is_`true` _if for the_`ith` _query, there is a path between_`ai` _and_`bi` _, or_`answer[i]`_is_`false` _if there is no path._

Example 1:

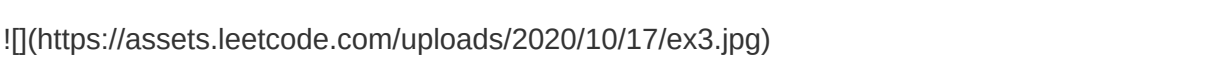
Input: n = 6, threshold = 2, queries = [[1,4],[2,5],[3,6]] **Output:** [false,false,true] **Explanation:** The divisors for each number: 1: 1 2: 1, 2 3: 1, _3_ 4: 1, 2, _4_ 5: 1, _5_ 6: 1, 2, _3_ , _6_ Using the underlined divisors above the threshold, only cities 3 and 6 share a common divisor, so they are the only ones directly connected. The result of each query: [1,4] 1 is not connected to 4 [2,5] 2 is not connected to 5 [3,6] 3 is connected to 6 through path 3--6

Example 2:



Input: n = 6, threshold = 0, queries = [[4,5],[3,4],[3,2],[2,6],[1,3]] **Output:** [true,true,true,true,true] **Explanation:** The divisors for each number are the same as the previous example. However, since the threshold is 0, all divisors can be used. Since all numbers share 1 as a divisor, all cities are connected.

Example 3:



Input: n = 5, threshold = 1, queries = [[4,5],[4,5],[3,2],[2,3],[3,4]] **Output:** [false,false,false,false,false] **Explanation:** Only cities 2 and 4 share a common divisor 2 which is strictly greater than the threshold 1, so they are the only ones directly connected. Please notice that there can be multiple queries for the same pair of nodes [x, y], and that the query [x, y] is equivalent to the query [y, x].

Constraints:

* `2 <= n <= 104` * `0 <= threshold <= n` * `1 <= queries.length <= 105` * `queries[i].length == 2` * `1 <= ai, bi <= cities` * `ai != bi`

Code Snippets

C++:

```
class Solution {
public:
vector<bool> areConnected(int n, int threshold, vector<vector<int>>& queries)
{

}
};
```

Java:

```
class Solution {
public List<Boolean> areConnected(int n, int threshold, int[][] queries) {
```

```
}
}
```

Python3:

```
class Solution:
def areConnected(self, n: int, threshold: int, queries: List[List[int]]) ->
List[bool]:
```