

Problem 3145: Find Products of Elements of Big Array

Problem Information

Difficulty: Hard

Acceptance Rate: 23.38%

Paid Only: No

Tags: Array, Binary Search, Bit Manipulation

Problem Description

The **powerful array** of a non-negative integer `x` is defined as the shortest sorted array of powers of two that sum up to `x`. The table below illustrates examples of how the **powerful array** is determined. It can be proven that the powerful array of `x` is unique.

num	Binary Representation	powerful array
1 | 0000 _1_ | [1] 8 | 0 _1_ 000 | [8] 10 |
0 _1_ 0 _1_ 0 | [2, 8] 13 | 0 _11_ 0 _1_ | [1, 4, 8] 23 | _1_ 0 _111_ | [1, 2, 4, 16]
The array `big_nums` is created by concatenating the **powerful arrays** for every positive integer `i` in ascending order: 1, 2, 3, and so on. Thus, `big_nums` begins as `[_1_ , _2_ , _1, 2_ , _4_ , _1, 4_ , _2, 4_ , _1, 2, 4_ , _8_ , ...]`.

You are given a 2D integer matrix `queries`, where for `queries[i] = [fromi, toi, modi]` you should calculate `(big_nums[fromi] * big_nums[fromi + 1] * ... * big_nums[toi]) % modi`.

Return an integer array `answer` such that `answer[i]` is the answer to the `ith` query.

Example 1:

Input: queries = [[1,3,7]]

Output: [4]

Explanation:

There is one query.

`big_nums[1..3] = [2,1,2]` . The product of them is 4. The result is `4 % 7 = 4.`

****Example 2:****

****Input:**** queries = [[2,5,3],[7,7,4]]

****Output:**** [2,2]

****Explanation:****

There are two queries.

First query: `big_nums[2..5] = [1,2,4,1]` . The product of them is 8. The result is `8 % 3 = 2` .

Second query: `big_nums[7] = 2` . The result is `2 % 4 = 2` .

****Constraints:****

* `1 <= queries.length <= 500` * `queries[i].length == 3` * `0 <= queries[i][0] <= queries[i][1] <= 1015` * `1 <= queries[i][2] <= 105`

Code Snippets

C++:

```
class Solution {
public:
vector<int> findProductsOfElements(vector<vector<long long>>& queries) {
}
```

Java:

```
class Solution {
public int[] findProductsOfElements(long[][] queries) {
}
```

Python3:

```
class Solution:  
    def findProductsOfElements(self, queries: List[List[int]]) -> List[int]:
```