2464. Minimum Subarrays in a Valid Split Premium

Medium Topics Hint

You are given an integer array `nums`.

Splitting of an integer array `nums` into **subarrays** is **valid** if:

- the *greatest common divisor* of the first and last elements of each subarray is **greater** than `1`, and
- each element of `nums` belongs to exactly one subarray.

Return *the **minimum** number of subarrays in a **valid** subarray splitting of* `nums`. If a valid subarray splitting is not possible, return `-1`.

Note that:

- The **greatest common divisor** of two numbers is the largest positive integer that evenly divides both numbers.
- A **subarray** is a contiguous non-empty part of an array.

Example 1:

```
Input: nums = [2,6,3,4,3]
Output: 2
Explanation: We can create a valid split in the following way: [2,6] | [3,4,3].
- The starting element of the 1st subarray is 2 and the ending is 6. Their greatest common divisor is 2, which is greater than 1.
- The starting element of the 2nd subarray is 3 and the ending is 3. Their greatest common divisor is 3, which is greater than 1.
It can be proved that 2 is the minimum number of subarrays that we can obtain in a valid split.
```

Example 2:

```
Input: nums = [3,5]
Output: 2
Explanation: We can create a valid split in the following way: [3] | [5].
- The starting element of the 1st subarray is 3 and the ending is 3. Their greatest common divisor is 3, which is greater than 1.
- The starting element of the 2nd subarray is 5 and the ending is 5. Their greatest common divisor is 5, which is greater than 1.
It can be proved that 2 is the minimum number of subarrays that we can obtain in a valid split.
```

Example 3:

```
Input: nums = [1,2,1]
Output: -1
Explanation: It is impossible to create valid split.
```

Constraints:

- `1 <= nums.length <= 1000`
- `1 <= nums[i] <= 10^5`

Seen this question in a real interview before? 1/5

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Topics

Array Math Dynamic Programming Number Theory

Hint 1

Find the minimum number of subarrays needed to validly split each prefix of the input array a.

Hint 2

Denote dp[i] as the minimum number of subarrays needed to validly split [a[0], a[1], ... , a[i - 1]], where dp[0] = 0.

Hint 3

Think about the dynamic programming transitions.

Hint 4

If we split the first i elements of the array, the last subarray in this splitting will end with a[i - 1] and start with some a[j], where gcd(a[j], a[i - 1]) ≠ 1. Then, we need to validly split the first j elements of the array, or [a[0]...a[j - 1]].

Hint 5

Iterate over all possible j < i such that gcd(a[j], a[i - 1]) ≠ 1 and let dp[i] = min(dp[i], dp[j] + 1).

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