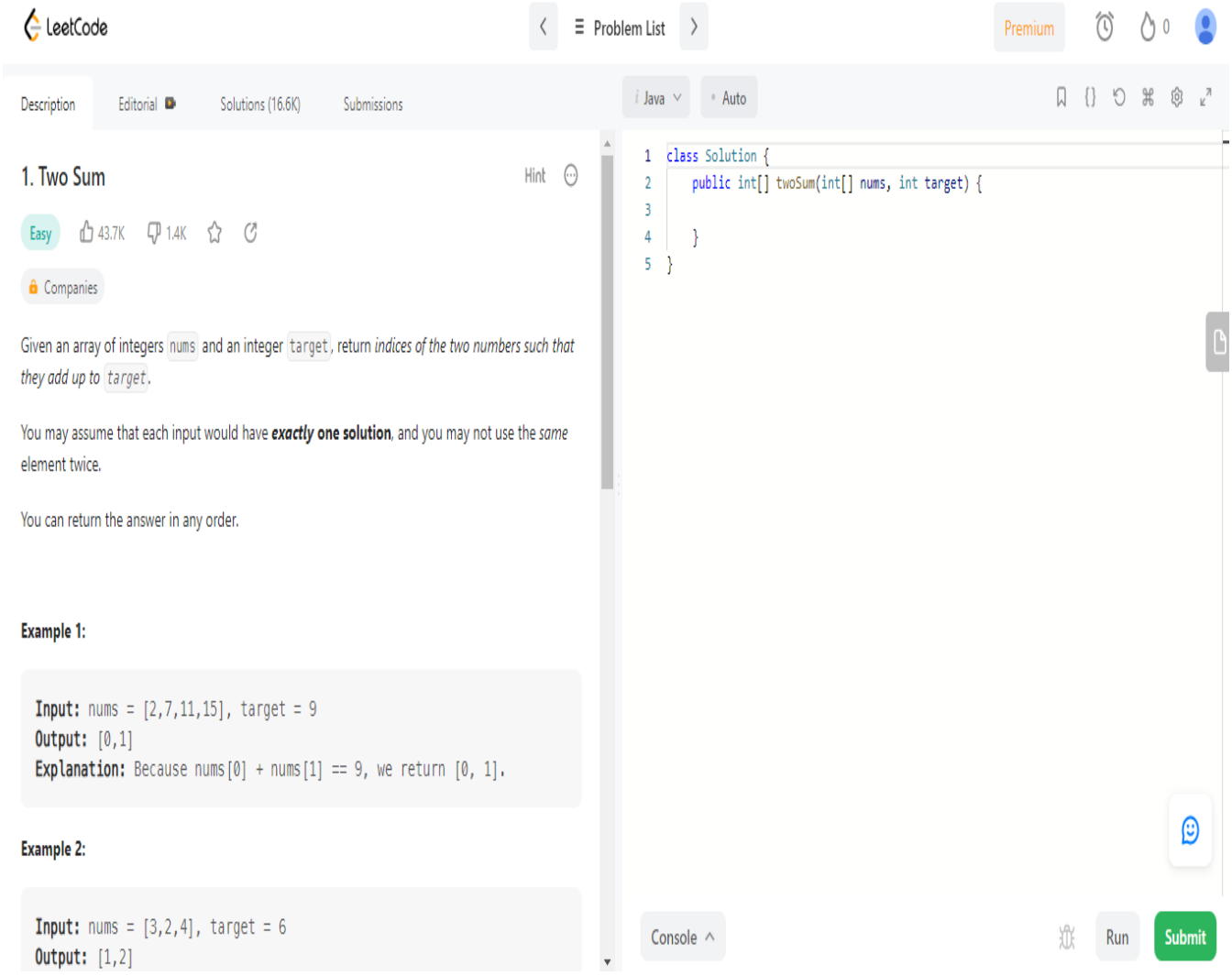
TWO SUM (EASY)



- **Approaches to solve problem**

  1- First over the brute force approach.

  - We check array if equal null Or length < 2 Return null.
  - We will perform a nested ‘for’ loop

For each of element ‘x’ in array.

- Initialize variable called ‘diff’ equal target number minus element of array ‘x’.
- We will want to perform another ‘for’ loop to find ‘x + 1’, check if ‘x + 1’ equal ‘diff’.
- If true return array [x, x + 1].
- If false return null.

Analysis

time complexity: O(n^2)

2- Optimized Approach

- We can further optimize the above solution approach by using a set.
- The algorithm for this optimal approach is as follows:
  1. Initialize an empty HashSet.
  2. For each integer in the array:
     - 2.1 Calculate the difference between the current integer and the targetSum.
     - 2.2 Check whether the difference calculated above is present in the set.
       - 2.2.1 If the difference already exists in the set, return the current element and difference as the result.

2.2.2 Otherwise, insert the current integer into the set.

Analysis

The time complexity : O(n)

3- Use Sorting along with the two-pointer approach

There is another approach which works when you need to return the numbers instead of their indexes. Here is how it works:

1- Sort the array.

2- Initialize two variables, one pointing to the beginning of the array (left) and another pointing to the end of the array (right).

3- Loop until left < right, and for each iteration.

3.1- if arr[left] + arr[right] == target, then return the indices.

3.2- if arr[left] + arr[right] < target, increment the left index.

3.3- else, decrement the right index.

This approach is called the two-pointer approach. It is a very common pattern for solving array related problems.

The time complexity : O(nlogn)