

Algorithms

Binary Search Homework 2

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Problem #1: [LeetCode 1283](#) - Find the Smallest Divisor Given a Threshold

- Given an array of integers and an integer **threshold**, find the **smallest positive integer** divisor such that:
 - When we divide all the array by this divisor (**ceil** division, e.g. $7/3 = 2.3333 = 3$)
 - ...and sum the division's result \Rightarrow sum result \leq threshold
- `int smallestDivisor(vector<int> &nums, int threshold)`
 - Tip: whenever I skip limits (such total number of items), I just mean you shouldn't depend on this information

Example 1:

Input: `nums = [1,2,5,9], threshold = 6`

Output: 5

Explanation: We can get a sum to 17 ($1+2+5+9$) if the divisor is 1.

If the divisor is 4 we can get a sum of 7 ($1+1+2+3$) and if the divisor is 5 the sum will be 5 ($1+1+1+2$).

Example 2:

Input: `nums = [44,22,33,11,1], threshold = 5`

Output: 44

Example 3:

Input: `nums = [21212,10101,12121], threshold = 1000000`

Output: 1

Example 4:

Input: `nums = [2,3,5,7,11], threshold = 11`

Output: 3

Problem #2: [LeetCode 1482](#) - Minimum Number of Days to Make m Bouquets

Given an integer array `bloomDay`, an integer `m` and an integer `k`.

We need to make `m` bouquets. To make a bouquet, you need to use `k` **adjacent flowers** from the garden.

The garden consists of `n` flowers, the `i`th flower will bloom in the `bloomDay[i]` and then can be used in **exactly one** bouquet.

Return *the minimum number of days* you need to wait to be able to make `m` bouquets from the garden. If it is impossible to make `m` bouquets return **-1**.

- `int minDays(vector<int> &bloomDay, int total_bouquets, int flowers_per_bouquet)`
 - `flowers_per_bouquet <= bloomDay.length`

Example 1:

Input: bloomDay = [1,10,3,10,2], m = 3, k = 1

Output: 3

Explanation: Let's see what happened in the first three days. x means flower bloomed and _ means flower didn't bloom in the garden.

We need 3 bouquets each should contain 1 flower.

After day 1: [x, _, _, _, _] // we can only make one bouquet.

After day 2: [x, _, _, _, x] // we can only make two bouquets.

After day 3: [x, _, x, _, x] // we can make 3 bouquets. The answer is 3.

Example 2:

Input: bloomDay = [1,10,3,10,2], m = 3, k = 2

Output: -1

Explanation: We need 3 bouquets each has 2 flowers, that means we need 6 flowers. We only have 5 flowers so it is impossible to get the needed bouquets and we return -1.

Example 3:

Input: bloomDay = [7,7,7,7,12,7,7], m = 2, k = 3

Output: 12

Explanation: We need 2 bouquets each should have 3 flowers.

Here's the garden after the 7 and 12 days:

After day 7: [x, x, x, x, _, x, x]

We can make one bouquet of the first three flowers that bloomed. We cannot make another bouquet from the last three flowers that bloomed because they are not adjacent.

After day 12: [x, x, x, x, x, x, x]

It is obvious that we can make two bouquets in different ways.

Example 4:

Input: bloomDay = [1000000000,1000000000], m = 1, k = 1

Output: 1000000000

Explanation: You need to wait 1000000000 days to have a flower ready for a bouquet.

Example 5:

Input: bloomDay = [1,10,2,9,3,8,4,7,5,6], m = 4, k = 2

Output: 9

Problem #3: [LeetCode 475](#) - Heaters

Winter is coming! During the contest, your first job is to design a standard heater with a fixed warm radius to warm all the houses.

Every house can be warmed, as long as the house is within the heater's warm radius range.

Given the positions of `houses` and `heaters` on a horizontal line, return *the minimum radius standard of heaters so that those heaters could cover all houses*.

Notice that all the `heaters` follow your radius standard, and the warm radius will be the same.

- `int findRadius(vector<int> &houses, vector<int> &heaters)`

Example 1:

Input: houses = [1,2,3], heaters = [2]

Output: 1

Explanation: The only heater was placed in the position 2, and if we use the radius 1 standard, then all the houses can be warmed.

Example 2:

Input: houses = [1,2,3,4], heaters = [1,4]

Output: 1

Explanation: The two heater was placed in the position 1 and 4. We need to use radius 1 standard, then all the houses can be warmed.

Example 3:

Input: houses = [1,5], heaters = [2]

Output: 3

“Acquire knowledge and impart it to the people.”

“Seek knowledge from the Cradle to the Grave.”