2020 04 25 – Binary Search

Q1. Find First and Last Position of Element in Sorted Array

Link:https://leetcode.com/problems/find-first-and-last-position-of-element-in-sorted-array/

Given an array of integers `nums` sorted in ascending order, find the starting and ending position of a given `target` value. Your algorithm's runtime complexity must be in the order of *O*(log *n*). If the target is not found in the array, return `[-1, -1]`.

Example 1

```
Input: nums = [5,7,7,8,8,10],
target = 8
Output: [3,4]
```

Example 2

```
Input: nums = [5,7,7,8,8,10], target = 6

Output: [-1,-1]
```

Q2. Capacity To Ship Packages Within D Days

Link: https://leetcode.com/problems/capacity-to-ship-packages-within-d-days/

A conveyor belt has packages that must be shipped from one port to another within `D` days.

The `i`-th package on the conveyor belt has a weight of `weights[i]`. Each day, we load the ship with packages on the conveyor belt (in the order given by `weights`). We may not load more weight than the maximum weight capacity of the ship.

Return the least weight capacity of the ship that will result in all the packages on the conveyor belt being shipped within `D` days.

Example 1

Input: weights = [1,2,3,4,5,6,7,8,9,10],
D = 5
Output: 15
Explanation:
A ship capacity of 15 is the minimum to ship all the packages in 5 days like this:
1st day: 1, 2, 3, 4, 5
2nd day: 6, 7
3rd day: 8
4th day: 9
5th day: 10

Note that the cargo must be shipped in the order given, so using a ship of capacity 14 and splitting the packages into parts like (2, 3, 4, 5), (1, 6, 7), (8), (9), (10) is not allowed.

Example 2

```
Input: weights = [3,2,2,4,1,4], D = 3
Output: 6
Explanation:
A ship capacity of 6 is the minimum to
ship all the packages in 3 days like
this:
1st day: 3, 2
2nd day: 2, 4
3rd day: 1, 4
```

Q3. Kth Smallest Element in a Sorted Matrix

Link: https://leetcode.com/problems/kth-smallest-element-in-a-sorted-matrix/

Given a *n* x *n* matrix where each of the rows and columns are sorted in ascending order, find the kth smallest element in the matrix.

Note that it is the kth smallest element in the sorted order, not the kth distinct element.

Example:
matrix = [
  [1, 5, 9],
  [10, 11, 13],
  [12, 13, 15]
],
k = 8,

return 13.
Note:
You may assume k is always valid, $1 \le k \le n^2$.

Q4. Subarray Sums Divisible by K

Link: https://leetcode.com/problems/kth-smallest-number-in-multiplication-table/

Nearly every one have used the Multiplication Table. But could you find out the `k-th` smallest number quickly from the multiplication table?

Given the height `m` and the length `n` of a `m * n` Multiplication Table, and a positive integer `k`, you need to return the `k-th` smallest number in this table.

Example 1:
Input: m = 3, n = 3, k = 5
Output:
Explanation:
The Multiplication Table:
1 2 3
2 4 6
3 6 9

The 5-th smallest number is 3 (1, 2, 2, 3, 3).

Example 2:
Input: m = 2, n = 3, k = 6
Output:
Explanation:
The Multiplication Table:
1 2 3
2 4 6

The 6-th smallest number is 6 (1, 2, 2, 3, 4, 6).