1. Search in Rotated Sorted Array

There is an integer array nums sorted in ascending order (with distinct values).

Prior to being passed to your function, nums is possibly rotated at an unknown pivot index k (1 <= k < nums.length) such that the resulting array is [nums[k], nums[k+1], ..., nums[n-1], nums[0], nums[1], ..., nums[k-1]] (0-indexed). For example, [0,1,2,4,5,6,7] might be rotated at pivot index 3 and become [4,5,6,7,0,1,2].

Given the array nums after the possible rotation and an integer target, return the index of target if it is in nums, or -1 if it is not in nums.

You must write an algorithm with O(log n) runtime complexity.

Example 1: Input: nums = [4,5,6,7,0,1,2], target = 0 Output: 4

Example 2: Input: nums = [4,5,6,7,0,1,2], target = 3 Output: -1

Example 3: Input: nums = [1], target = 0 Output: -1

2. Number of Distinct Averages

You are given a 0-indexed integer array nums of even length. As long as nums is not empty, you must repetitively:

Find the minimum number in nums and remove it. Find the maximum number in nums and remove it. Calculate the average of the two removed numbers.The average of two numbers a and b is (a + b) / 2.

For example, the average of 2 and 3 is (2 + 3) / 2 = 2.5. Return the number of distinct averages calculated using the above process. Note that when there is a tie for a minimum or maximum number, any can be removed. Example 1:

Input: nums = [4,1,4,0,3,5] Output: 2

Explanation:
1. Remove 0 and 5, and the average is (0 + 5) / 2 = 2.5. Now, nums = [4,1,4,3].
2. Remove 1 and 4. The average is (1 + 4) / 2 = 2.5, and nums = [4,3].
3. Remove 3 and 4, and the average is (3 + 4) / 2 = 3.5.
Since there are 2 distinct numbers among 2.5, 2.5, and 3.5, we return 2.
Example 2:

Input: nums = [1,100]
Output: 1
Explanation:
There is only one average to be calculated after removing 1 and 100, so we return 1.

3. Maximum Average pass Ratio

There is a school that has classes of students and each class will be having a final exam. You are given a 2D integer array classes, where classes[i] = [passi, totali]. You know beforehand

that in the ith class, there are totali total students, but only passi number of students will pass the exam.

You are also given an integer extraStudents. There are another extraStudents brilliant students that are guaranteed to pass the exam of any class they are assigned to. You want to assign each of the extraStudents students to a class in a way that maximizes the average pass ratio across all the classes.

The pass ratio of a class is equal to the number of students of the class that will pass the exam divided by the total number of students of the class. The average pass ratio is the sum of pass ratios of all the classes divided by the number of the classes.

Return the maximum possible average pass ratio after assigning the extraStudents students. Answers within 10-5 of the actual answer will be accepted.
Example 1: Input: classes = [[1,2],[3,5],[2,2]], extraStudents = 2 Output: 0.78333
Explanation: You can assign the two extra students to the first class. The average pass ratio will be equal to (3/4 + 3/5 + 2/2) / 3 = 0.78333.

Example 2: Input: classes = [[2,4],[3,9],[4,5],[2,10]], extraStudents = 4
Output: 0.53485

4. Second largest digit in string
Given an alphanumeric string s, return the second largest numerical digit that appears in s, or -1 if it does not exist.

An alphanumeric string is a string consisting of lowercase English letters and digits.
Example 1:

Input: s = "dfa12321afd" Output: 2

Explanation: The digits that appear in s are [1, 2, 3]. The second largest digit is 2.

Example 2: Input: s = "abc1111" Output: -1
Explanation: The digits that appear in s are [1]. There is no second largest digit.