CS608-SPRING2023: ALGORITHMS & COMPUTING THEORY

Assignment#4 - TOTAL POINTS: 100

DUE DATE: 04/20/2022 (April 20th)

Team Assignment

S.No.	Questions	Points	Self-Assessment
1	Given an array of integers "nums", sort the array in ascending order and return it. You must solve the problem **without using any built-in functions** and using **merge sort** in O(nlog(n)) time complexity. Example 1: Input: nums = [5,2,3,1] Output: [1,2,3,5] **Explanation**: After sorting the array, the positions of some numbers are not changed (for example, 2 and 3), while the positions of other numbers are changed (for example, 1 and 5). Example 2: Input: nums = [5,1,1,2,0,0] Output: [0,0,1,1,2,5] **Explanation**: Note that the values of nums are not necessarily unique.	25	
2	Assume you are an awesome friend and want to give your friends some cookies. But, you should give each friend at most one cookie. Each friend 'i' has a greed factor g[i], which is the minimum size of a cookie that the friend will be content with; and each cookie j has a size s[j]. If s[j] >= g[i], we can assign the cookie j to the friend i, and the friend i will be content. Your goal is to maximize the number of your content friends and output the maximum number. Example 1: Input: g = [1,2,3], s = [1,1] Output: 1 **Explanation**: You have 3 friends and 2 cookies. The greed factors of 3 friends are 1, 2, 3. And even though you have 2 cookies, since their size is both 1, you could only make the friend whose greed factor is 1 content. You need to output 1. Example 2: Input: g = [1,2], s = [1,2,3] Output: 2	25	

	Explanation: You have 2 friends and 3 cookies. The greed factors of 2 friends are 1, 2. You have 3 cookies, and their sizes are big enough to gratify all the friends, You need to output 2.		
3	You have some apples and a basket that can carry up to 5000 units of weight. Given an integer array weight where weight[i] is the weight of the 'i'th apple, return the maximum number of apples you can put in the basket. Example 1: Input: weight = [100,200,150,1000] Output: 4 Explanation: All 4 apples can be carried by the basket since their sum of weights is 1450. Example 2: Input: weight = [900,950,800,1000,700,800] Output: 5 **Explanation**: The sum of weights of the 6 apples exceeds 5000 so we choose any 5 of them.	25	
4	At a lemonade stand, each lemonade costs $5. Customers are standing in a queue to buy from you and order one at a time (in the order specified by bills). Each customer will only buy one lemonade and pay with either a $5, $10, or $20 bill. You must provide the correct change to each customer so that the net transaction is that the customer pays $5. Note that you do not have any change in hand at first. Given an integer array bills where bills[i] is the bill the ith customer pays, return true if you can provide every customer with the correct change, or false otherwise. Example 1: Input: bills = [5,5,5,10,20] Output: true **Explanation:** From the first 3 customers, we collect three $5 bills in order. From the fourth customer, we collect a $10 bill and give back a $5. From the fifth customer, we give a $10 bill and a $5 bill. Since all customers got correct change, we output true. Example 2: Input: bills = [5,5,10,10,20] Output: false **Explanation:** From the first two customers in order, we collect two $5 bills. For the next two customers in order, we collect a $10 bill and give back a $5 bill. For the last customer, we cannot give the change of $15 back because we only have two $10 bills. Since not every customer received the correct change, the answer is false.	25	

Submission

- Submit a python **notebook**(of file type **.ipynb**) with comments above each code block/line explaining its purpose. Also submit **screenshot** of the result/output you get.
- You may not be graded full points if your program doesn't execute or produce intended results.
- Late submission up to one week after **due date** will incur **10% loss** of total points earned. 5% every week thereafter until end date.
- **Be careful not to share your code. You may lose points by sharing your work. Similarity scores will be checked.**
- Attach this file with self-assessment. This is for your reference if you answered question completely.