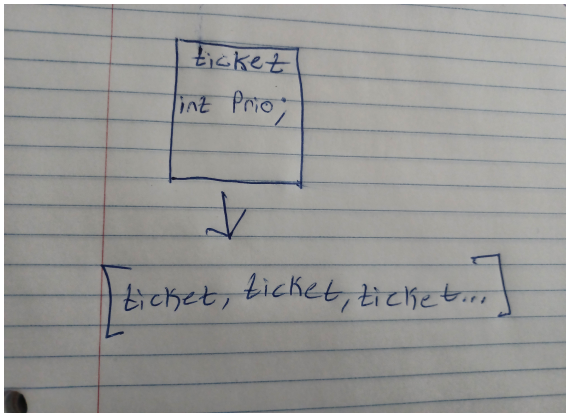
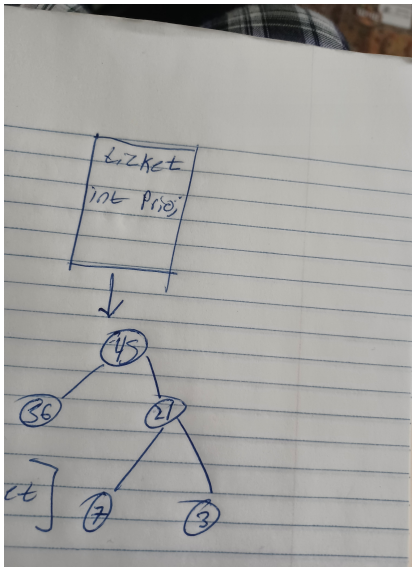
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4/20/2022
Graduating Senior Exam

Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer service team needs a way to find the most urgent ticket in the system and remove it when it has been addressed. New tickets can arrive at any time.

a) A priority queue; a priority queue allows you to rank the tickets in order of priority followed by when it was submitted, exactly like they need.
b) Make each ticket an object with the priority as a field. Input the tickets into an array, and sort by priority.



c) Make each ticket an object with the priority and submitted time as fields. Input the tickets into a max heap, where priority is the key.



Question 2: Write a function in a language of your choice that has two parameters: a string and a character. The function should return the number of times that the character occurs in the string.

Your language of choice (e.g. Python): Python

Your solution:

```
def charCounter(string, character):
    count = 0

    for char in string:
        if char == character:
            count += 1

    return count
```

Question 3: Consider a singly linked list that contains **n** floating point numbers and is maintained in ascending order. An additional **k** floating point numbers will be added to the list, one at a time. You may assume that **k** << **n**.

Best Case Time Complexity : O(k*n)

Explanation : A single node requires one iteration through the linked list to be added. We do this k times. Because k << n, we don't really need to consider the list as getting longer as each number is added for the purposes of time complexity.

Worst Case Time Complexity : O(k*n)

Explanation : The worst case and best case match in this case. Because the numbers are added one at a time, rather than provided as an array or other group, we have no way to improve upon the algorithm. Because there is no "best" way, there is also no worst way.

Question 4: List any extracurricular community involvement (e.g. the Gallatin Valley Food Bank or coaching), extracurricular university involvement (e.g. Engineering Ambassadors, Swing Cats, AWC or ACM) or paid internships (e.g. Workiva intern or Undergraduate Course Assistant) that you were involved with during your time at MSU. For each activity, (1) **provide** the name of the organization, (2) **describe** briefly your main activities and (3) **estimate** the total number of hours you spent. \

Organization	*Main Activities*	*Hours Spent (estimate)*
MSU Fencing	*Fencing (the Olympic sport, not creating fences)*	*5 hours*
Swingcats	*Dancing*	*45 minutes.*
Smash Society	*Playing Super Smash Bros.*	*Impossible to count; a very high number.*

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Algorithmic bias is when an algorithm is designed, intentionally or unintentionally, in a way that produces bias against a certain group of people.
b) If the college admissions software highly prioritized something like GPA or extracurriculars, then the algorithm would be biased towards wealthy people who can afford tutors and teachers for school, sports, and other interests.

Question 6: In 2010 Oracle sued Google claiming copyright and patent infringement for 11,500 lines of Java API copied code. Google used this small subset of code from the JAVA API for their mobile platform operating system. Pick a side (Google or Oracle) to win this lawsuit and explain 3 possible impacts to the computing industry of this win.

Side : Oracle

1. A win for Oracle would significantly affect the ability for developers to use APIs with peace of mind.
2. It might open the door for similar lawsuits to be filed against existing software.
3. As a result, developers might have to go back and revise old code to minimize use of APIs.

Question 7: In the ACM Code of Ethics and Professional Conduct, one ethical principle stated is to avoid harm. Describe three different types of harm that the software of an autonomous, self-driving car might cause.

1. Bugs in the software could literally kill someone.
2. “The trolley problem”; in the event a crash is inevitable, the software will somehow have to choose whose safety to prioritize, therefore causing harm to any other parties.
3. Self-driving car software could impact the livelihood of people who drive for a living.

Question 8: Describe your one-year plan following graduation. If you plan to work, list where you have applied (the company and the position) and mention whether you have received any offers. If you plan to go to graduate school, list
where you have applied (the school and the area of study) and mention whether you have received any acceptances.

I don’t have a very good plan. I want to get a programming job somewhere in the Pacific Northwest, but I’d be okay with other places like Illinois, Massachusetts, and Colorado. For now, since I didn’t get an internship due to COVID, I’m going to work on personal projects to improve my resume.

Question 9: List any organized social activities that you were involved with during your time at MSU. For each activity, (1) provide the name of the organization, (2) estimate the total number of hours you spent.

I was not involved with any organized social activities.

Question 10: List any activities that you were involved with during your time at MSU that prepared you to work more effectively with teammates whose backgrounds are significantly different than your own. For each activity, (1) describe the activity and (2) estimate the total number of hours you spent.

I was not involved with any organized social activities.

Question 11: Name the most sophisticated version control system that you use and describe three nontrivial features it has.

Version Control System : Github

1. Branches; the ability to have multiple people working on their own branch and merge later allows you to have a high level of control over the changes to your project.
2. Integration with IDEs like Pycharm and IntelliJ make pushing and pulling very easy.
3. Being able to view and rollback to previous versions is critical for controlling your code.

Question 12: During your time at MSU, list any major non-classroom, non-paid activities that you engaged in to help prepare for your computer science career. For example, you might have taught yourself a programming language or attended a workshop on a CS topic. For each activity, estimate the number of hours spent.

Activity Description	*Hours Spent (estimate)*
Personal Projects	*10 hours*
Programming Content	*5 hours*