Montana State University Computer Science Department

Graduating Senior Exam

Fall Semester 2021, 80 minutes.

Your performance helps us assess how well we are meeting our stated learning outcomes for computer science majors. To pass this exam, spend at least 45 minutes in order to provide a carefully reasoned answer to each question. This information will help us make improvements.

Name Aurora Kehoe

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.

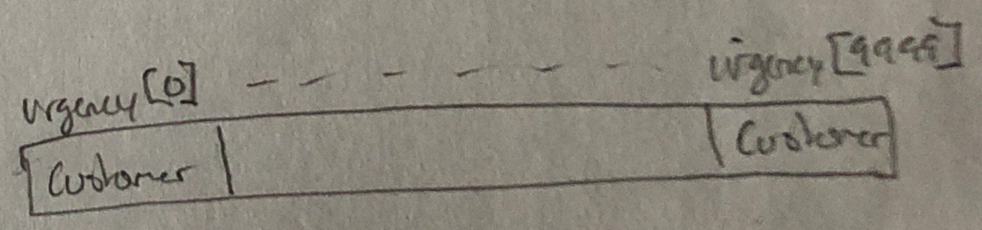
a) What simple data structure would best model this situation? Explain.

An array would work well, with the urgency score as the key. Each time a ticket is addressed, that element would be removed from the array

b) Describe one way in which this data structure could be implemented and draw a picture of that data structure.

```
String [] urgency = new string[9999]

urgency[0] = "customer Name";
:
urgency[9999] = "Customer Name";
```



c) Describe a second way in which this data structure could be implemented and draw a picture of that data structure.

Modifying the array to be an ArrayList could be a more helpful idea

```
ArrayList <String> urgentCustomers = new ArrayList<>();
UrgentCustomers.add("A very important Customer");
```



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): Java

Your solution:

```
private int returnCharNum (string original, char choice) {
    int charCount = 0;
    for(int i=0; i < original.length(); i++)
    {
        if (original.charAt(i)) == choice)
        {
            charCount ++;
        }
    }
    return charCount;
}
```

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 of algorithm:

Explanation of best case time complexity:

It's been over 3 years since I've worked with time complexity, I'm afraid I don't remember enough to complete this question.

Worst case time complexity of algorithm:

Explanation of worst case time complexity:

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)*
Techlink - paid internship	Testing code, writing documentation, training new interns	Employment start date was Feb 5, 2019 so very many hours
AWC	was the president for about 2 years and an advisor for another	I'm not sure over the years but very very many, easily over 100+
SwingCats	I went to a few meetings to meet people and attempt to dance better!	3 hours

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

Algorithmic bias occurs when data is tracked consciously or unconsciously on a very specific set of people, which causes it to make biased choices.

b) Provide a hypothetical example of how algorithmic bias could manifest itself in college admissions software.

If a college admissions software had algorithmic bias, that could manifest itself as over proportionately refusing admission to a certain collection of people based on maybe their name, as has been documented in some job scanning software. This would likely affect potential students who are PoC, as that demographic has unfortunately been some of the people most affected by algorithmic bias.

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 you choose to win: Oracle

First possible impact: An enormous effect would go forward to affect all companies, potentially, that use Java API code, causing these companies to change their code or potentially be shed by oracle.

Second possible impact: The practice of sharing code, even open source code, would likely become heavily restricted.

Third possible impact: The developers for Google's mobile platform OS would be under immense pressure to write software to replace that of the Java API.

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.

First type of harm: Hit a pedestrian if it deemed that the best way to keep its passenger safe in an emergency situation.

Second type of harm: Cause a wreck if it didn't properly recognize winter roads & didn't take proper precautions on the ice.

Third type of harm: Go the wrong way in a heavy construction zone if its cameras couldn't properly see the new temporary lines & got confused when all the road lines overlapped

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.

In my one year following graduation, I plan to get a job testing software in Bozeman.

I have applied to Workiva, Magnite, & Reposit. I haven't got offers yet but I have a positive relationship with my contacts from Magnite & Reposit & I will continue to be in contact with them.

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.

Organization Name	*Hours Spent (estimate)*
AWC - Cookies & Cream	7-8 hours including cleanup, around 3.5 hrs per event
AWC - CS welcome party	9 hours, I think I helped 3x with 3 hours each
AWC - Vegas trip!	4 hours, I think. It was awesome!

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.

Activity Description	*Hours Spent (estimate)*
ESOF 322 - group work	I think 5, group work cut short from COVID
ESOF 423- Semester long group project	Over 100, we put a lot of work into that project
Engineerathon	10-10 hours

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

Name of most sophisticated version control system: GitHub

Non-trivial feature 1: The ability to rollback faulty commits

Non-trivial feature 2: Branch Deletion confirmation, also protected branches

Non-trivial feature 3: Seeing the differences of current vs. saved changes.

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)*
WIE Banquets	19 hours, about 3per event
AWC/ACM hosted events for career advice	18 hours

Best wishes wrapping up the semester and in the future!

Thank you. ☺