Montana State University Computer Science Department

Graduating Senior Exam

Spring Semester 2022, 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 Christopher Danielson

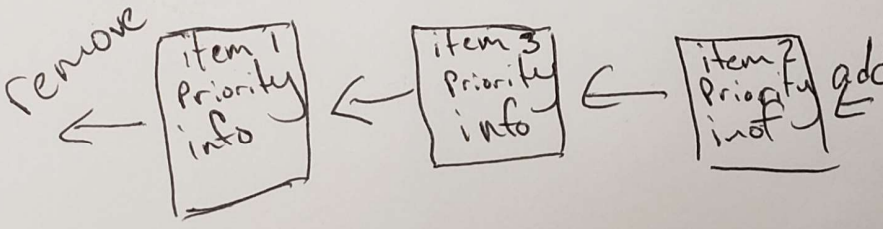
Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer 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.

I would use a priority queue. A queue allows for tickets to be added at the back and taken from the front and with this one the most important ones are done first.

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

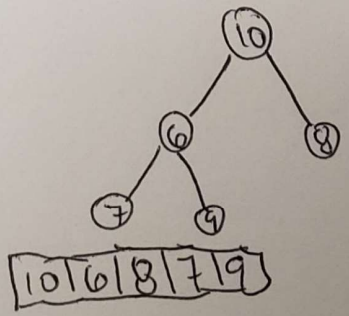
this could be implemented with a linked list.



I would store a Priority value to determine where a ticket gets inserted

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

A Heap could also be used to implement a priority queue



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 func(myString, myChar):
    x = 0
    for c in myString:
        if c == myChar:
            x++
    return x
```

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:

$O(n \log n)$

Explanation of best case time complexity:

you can use merge sort to add elements to a list. Merge sort has a time complexity of $O(n \log n)$

Worst case time complexity of algorithm:

$O(n^2)$

Explanation of worst case time complexity:

Bubble Sort is one of the slower sorting algorithms and it has a $O(n^2)$ time compelity. So the sort reads all the nodes twice.

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)*
Montana State University	Teaching assistant	32 hours

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

algorithmic bias is having an algorithm that will make unfair desicions

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

an example of this is two students that have the same scores but one is from Utah and the other is from Ohio. bias is one of those people is accepted and the other isn't

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: google

First possible impact:

Allows devs to reverse engineer librairys for their own Poogects

Second possible impact:

Small devoplers have added licences to there repositorys

Third possible impact:

Code might became more open stoge ~~Be~~ Cause people can just reverse engineer the code

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:

a car chrashing into people to ~~K~~keep the pasangers safe. This mental and pysichal damage

Second type of harm:

a way it could harm with information reasle is by giving away login info for apps that are on the car like in a tesla

Third type of harm:

a way it could ~~d~~damage property is if the car has an ersor and croshes into a grage door causing damge to property

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.

After graduation I plan to work. I have applied and recived an offer from Zoof Enterprises.

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)*
didn't do any organized	social activites

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)*
Worked with some IE to help them sort excel sheets	5 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:

Project Managment - allows for teams to make project borads linked to each project.

Non-trivial feature 2:

Pull Requests and code Review - allows team members to review code seprately from main code branch

Non-trivial feature 3:

team adminastration - allows team leaders to set the rights of different team members on the project to make sure code reweiw is done

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)*
Wrote small python	5 hours
scripts for other people	

Best wishes wrapping up the semester and in the future!