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.

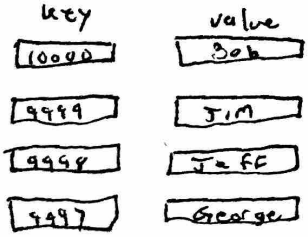
Name Charlie Melnarik

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.

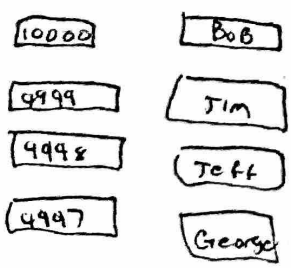
a sorted dictionary would work well in this situation. a key would be represented as the urgency number and the value would be the customer. since we want to remove the highest score, and since the dictionary is sorted by key, a simple pop would remove the customer in question.

b) Describe one way in which this data structure could be implemented and draw a picture of that data structure. you could implement this fairly easily in Python by using Python dictionarys.



since Bob is at the top of the list because of his score, a pop would get rid of him.

c) Describe a second way in which this data structure could be implemented and draw a picture of that data structure. you could also in Python, do a dictionary search and then pop that value.



The dictionary looks the same but any one could be deleted instead of only the end of the list.

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):

Your solution: Python

```
def Charcount(Char, Str):
    count = 0
    for i in Str:
        if i = Char:
            count += 1

    Print(count)
```

lowercase L → l

```
Charcount("l", "hello")
```

output: 2

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(1)

Explanation of best case time complexity:

Since it doesnt specify where the k elements will be added, we can assume they are just appended to the end of the list, so the only operation is inserting element k at the end which is O(1) time

Worst case time complexity of algorithm:

O(N)

Explanation of worst case time complexity:

If we had to traverse the list to find where to put the k elements, it would be O(n) time since traversing a list is O(N).

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)*
None		

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

an algorithm might return different results based on information it's gathered. This could have a huge range of applications.

b) Provide a hypothetical example of how algorithmic bias could manifest itself in college admissions software. You could have a software that digs into information about a person that would affect their admittance into college. It could calculate its decision based on race, sex, age, etc... where as a college not using software wouldn't judge based on that info as much.

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: API's could become less available for everyday use.

Second possible impact: writing code would take much longer to write and produce without API's

Third possible impact: the computer industry would possibly slow down on its growth.

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: obviously physical harm is a big one. especially as of now, self driving cars aren't perfect and do crash.

Second type of harm: computers are hackable. if someone hacks your car, they could harm you physically and mentally,

Third type of harm: I would say that if self driving cars become a big thing, even if kids have to take drivers ed, they will forget how to drive and rules of the road if they never do it. Stuck then in a real vehicle and they could hurt people (themselves and others)

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.

honestly I havent planned that far ahead Yet. I dont really know what I want to do, I am a Jack of all trades, kind of person. I feel like computer science is just another tool in my belt now. I like working / physical labor type stuff and IM not sure Yet if I want to sit behind a computer for the rest of my life,

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)*
NONE	

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)*
Computer Science Classes	200

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: Git

Non-trivial feature 1: Git push is a very easy command to put you work onto git to save or share

Non-trivial feature 2: Git pull, also easy way to get your work/repo from git to your local machine

Non-trivial feature 3: Git clone, a good way to pull someone elses work/repo to your local machine to use or edit,

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)*
Selenium	20
Flask / Publishing	50
Writing various Bots / automation	60

Best wishes wrapping up the semester and in the future!