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 Lenin Lewis

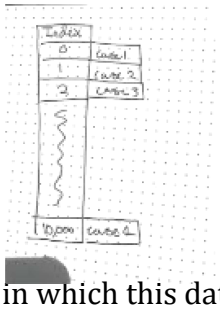
Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer 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 hash table would be the best model. Having a hash table allows the customer service team to search the scores to find the most urgent cases.

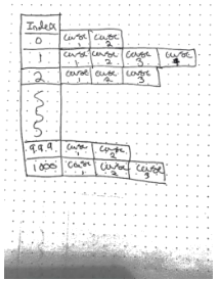
b) Describe one way in which this data structure could be implemented and draw a picture of that data structure.

There could be 10,000 index in the hash table and all the cases scored a 10,000 would be at that index it would allow for the customer service to look at all of the items at a score and decide what needs to be done.



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

There could be a 1,000 indexs and the case scores can be grouped in size 100. So the first index is 0-99 and the customer service can have different teams on each section to get all the cases completed.



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 count(sentence, letter):
    sentence = sentence.lower()
    letter = letter.lower()
    count = 0

    for i in range(len(sentence)) :
        if (sentence[i] == letter):
            count += 1
    return count


_sentence= "Montana State University has a Computer Science Program"
_letter = 'S'
print(count(_sentence, _letter))
```

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:

The best case time complexity is O(n)

Explanation of best case time complexity:

The best case time complexity is O(n) since you will have to go through the list only once since k is less then n, so k can be inserted into list with only traversing over it once.

Worst case time complexity of algorithm:

O(log(n))

Explanation of worst case time complexity:

The worst case time complexity O(log(n)) would happen if the number of operations decreases as the number of inputs increased but that would not happen in this case. In this case the number of operations changes at the same rate as the inputs

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)*
Rankin Elementary School	Interned for a semester in a special ed classroom	200 hours
Gianforte Undergrad Research Assistant	natural language processing	300 hours
Roost Fried Chicken	Expeditor	2,000 hours
Smoke Fire and Coal	Prep Lead & Baker	2,000 hours
American Computer & Robotics Museum	Tour Guide	1000 hours

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a)F Describe briefly what algorithmic bias is.

The IEEE P7003 is the methodology for ethical life cycle concerns. It is a systems that has engineers consider ethics as they create a new technology. This principle works with bias issues

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

Someone creating a algorithm to prescreen applications based off names could ignore certain types of names if the system does not have the name in its list already. In this case the software would not have a designated spot for names so the software would have to look for names.

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: More people can use this case as a reason for it to be okay to copy code and fight for more open source code from corporations.

Second possible impact: Corporations might start putting bad code in open source so if someone copies their code it will not work.

Third possible impact: Google could keep taking other corporations code until they control the industry since they were able to take code from Oracle.

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 self driving car can kill the user to protect the bikers in the road.

Second type of harm: The self driving car can kill people on the street to protect the driver from a crash.

Third type of harm: The self driving car can miss read how far away a car is from it and run into it cause a crash between the cars.

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 will be entering a career at Zoot Enterprises as a Solutions Developer, while coming back to MSU to complete two classes in my BS for Psychology. After the I finish my Psychology degree, I may continue my education psychology while working at Zoot.

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)*
N/A	

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 in kitchens downtown: had to talk to a large group of line cooks to make sure the food got out in a timely manner	4,000 hours
EWB: club on campus that mutiple engineers work together to create products for other countries	150 hours
Tour guide at the American Computer & Robotics Museum	1000 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:
It allows for group members to assign bug tracking to members

Non-trivial feature 2:
You are able to have your code on GitHub and connect it hosting sites to deploy websites and apps online.

Non-trivial feature 3:
The code can be rolled back to old versions, so if a bug appears in the code you are able to change it to last working version.

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)*
Learned code languages on my own	300 hours
Deveopled a website for family friend	160 hours
Wrote codes to make logic games for local machine	200 hours

Best wishes wrapping up the semester and in the future!