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 Max Carr

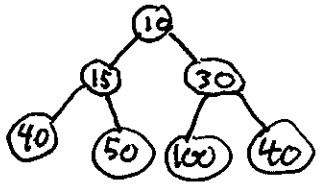
Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer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

Priority Queue.
Priority queues add/sort/remove based on Priority.

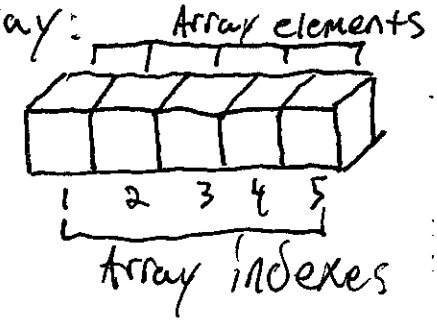
b) Describe one way in which this data structure could be implemented and draw a picture of that data structure.

Heap data structure:



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

Array:



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:

```
Public int countChar(String str, Char c){
    int count=0;
    for(int=0; i<str.length(); i++){
        if(str.charAt(i)==c){
            count++;
        }
    }
    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 of algorithm:

Explanation of best case time complexity:

I haven't touched time complexities in almost 4 years due to an absence from school and a general hatred for them.

I know they calculate the life of a loop but know nothing else.

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)*
Swing Cats	Dancing/Set-up	20+
Eagle Mount	Volunteering	30+
Exponent News	Head of events	[redacted] 50+
[redacted]		
MSU TA	grading for python	60+
MSU SmartyCats tutor	CSCI, Python, Java, C, HTML5, etc.	50

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

An algorithm that unfairly or unjustly defines a [redacted] framework by which an individual or organization determines the outcome of another individual or organization.

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

Software that accepts or denies applicants based on resemblence to past success.

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: Avoidance of a holders Monopoly which can cause public harm.

Second possible impact:
The opening to new opportunities with technology due to more programmers having access.

Third possible impact:
The potential for oracle to find and patch Mistakes.

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:
Vehicle accidents, code ~~does~~ and servers can fail, could cause extreme accidents and harm.

Second type of harm:
Gridlock, could have detrimental consequences.

Third type of harm:
Failure to deliver rider to correct location, such as a hospital.

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 plan to work for Heffernan Technologies.
I have applied and recieved an offer.

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)*
Intramural Sports	50+
Bowling club	30+
Billiards club	20+
Video game club	100+
Philosophy Club	40+
Alpha Sigma Phi Fraternity	400-500 (Maybe more)
Swing Cats	20+

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)*
Greek life	500+
Philosophy Club	40+
EGEN 310R	absolutely no idea

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: N/A
Honestly don't know what that is.

Non-trivial feature 1:

Non-trivial feature 2:

Non-trivial feature 3:

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)*

If I'M being honest I have no interest in a career in computer sciences. Thus, I've spent no time on my own developing the skills necessary outside of class or work.

Best wishes wrapping up the semester and in the future!