Montana State CS Graduating Senior Exam

Academic Year 2023-2024, 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 Lukas Bernard

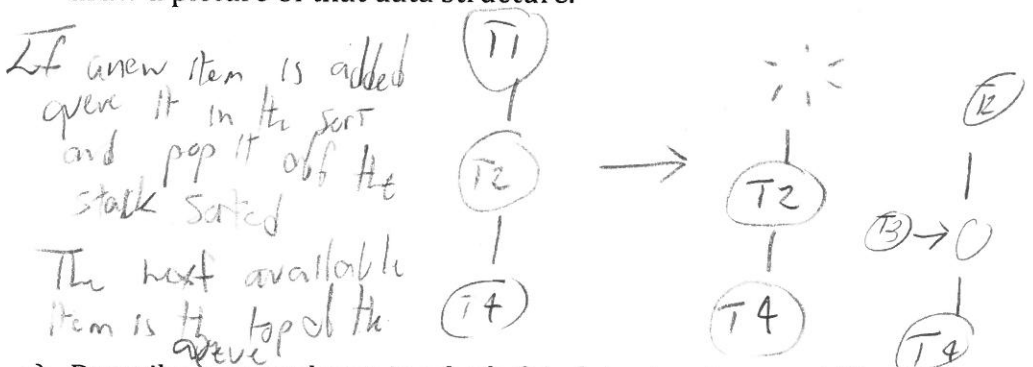
Major (Circle One): Computer Science B.A. or Computer Science B.S.

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.

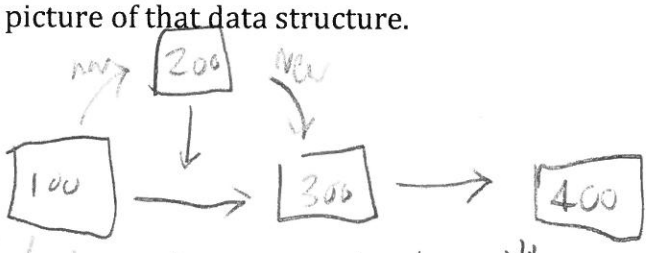
a) What simple data structure would best model this situation? Explain.

Priority Queue can add to the queue and pop off the end when handled. Add in place based on value

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



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



Singly Linked list. 100 is head with pointer to next value

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:

```
num = 0
for i in range(len(string)):
    if string[i] == character
        num += 1

return num
```

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:

You go through the linked list k and add each number to its correct slot by iterating through n till k>=n and insert

Best case is O(1) because the size of n could be 0 items.

Worst case time complexity of algorithm:

$O(n^2)$

Explanation of worst case time complexity:

Occurs when n and k contain more than 1 number.

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)*
Undergrad lab assistant	Help, answer questions	30
Penny Day	Sell merchandise	8
Poker club	Draw poker cards	7

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

The author can code with an implicit bias that affects the way the code may perform under certain circumstances

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

They may look for certain words in an application to approve it. which can be biased against those who applies really

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: It may allow for future more egregious infringements to be overlooked.

Second possible impact: The original authors do not recieve fair compensation.

Third possible impact: Makes it difficult to maintain competition by removing gaps in software.

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: It may make a poor judgment when presented with an impossible choice. I.e trolley problem.

Second type of harm: It may be willing to risk another drivers safety to protect its own driver.

Third type of harm: It cannot discern between right and wrong when someone around it makes a poor choice it has not been tested against before.

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.

Graduate School

Either CS or AI/ML

MSU
CSU
Idaho State

Question 9: List any organized social activities (e.g. SwingCats, church, a residence hall volleyball team) that you were involved with during your entire time at MSU. For each activity, (1) **provide** the name of the organization, (2) **estimate** the total number of hours you spent.

Organization Name	*Estimate Total Hours Spent*
ACM	5
Clean Snowmobile Club	4

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)*
Board Game Night	20

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: Repository: Stored repo to work with

Non-trivial feature 2: Rebasing: You can rebase your saved state to another saved state

Non-trivial feature 3: Merge conflict resolution: You can fix merge conflicts in real time when updating the source

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)*
Taught myself SQL	5 hours
Modular Rank	5 hours

Best wishes wrapping up the semester and in the future!

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Name Sam Bierens

Major (Circle One): Computer Science B.A. or Computer Science B.S.

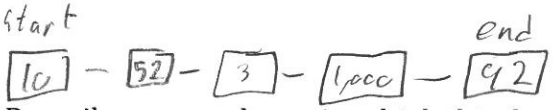
Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer 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 priority que, the reason why is the system will give tickets of the highest urgency scores first while ones with the same amount of urgency will be first come first served.

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

A simple way is with linear search where as each ticket is entered it gets push to the back then when the next ticket is pulled by the team it scans the list for the highest priority thats near the start.



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

The second way which is faster is using sorting methods so after each ticket is added it uses one of the sorting methods like bubble sort, insertion sort, ext to keep the list in order to decrease search time complexity



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:

```
public int Compare (String word, char letter) {
    x=0
    for (int i=0; i<=word.len; i++){
        if (letter == word[i]) {
            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:

$O(k)$

Explanation of best case time complexity:

if the list end and start are connected all you'd need is to go back one and add the point.

Worst case time complexity of algorithm:

$O(kn)$

Explanation of worst case time complexity:

You'd have to go through the entire list is not connected end to end for each point.

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)*
NA		

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

Certain algorythms are better for specific tasks and worse for others.

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

If the wrong process/Algorythm is used it could prioritize unwanted variables like basing admission on location or age not highschool graduates.

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:

Software usage will be more available without licensing.

Second possible impact:

More security and copyright prevention on software.

Third possible impact:

Future software becoming more similar instead of millions of way's to do one task.

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:

Prioritizing it's task and breaking speeding laws in the process.

Second type of harm:

Not seeing pedestrians and causing an accident.

Third type of harm:

Ignoring road warning's given by either visual signs or navigation.

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 and pay of my dept quickly. Ive applied to varios locations such as Applied Materials, Nomad, ext for entry level positions and have set up 2 interviews so far after graduation.

Question 9: List any organized social activities (e.g. SwingCats, church, a residence hall volleyball team) that you were involved with during your entire time at MSU. For each activity, (1) **provide** the name of the organization, (2) **estimate** the total number of hours you spent.

Organization Name	*Estimate Total Hours Spent*
Dorm RA activities	10 hours

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)*
Multi-disiplinary engineering project	60 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: Linux

Non-trivial feature 1:

Wire shark

Non-trivial feature 2:

best for muti- server tasks

Non-trivial feature 3:

better for security based programing

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)*
Cybrary coding lessons	200 hours estimated

Best wishes wrapping up the semester and in the future!

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Name Joshua Bowen

Major (Circle One): Computer Science B.A. or Computer Science B.S.

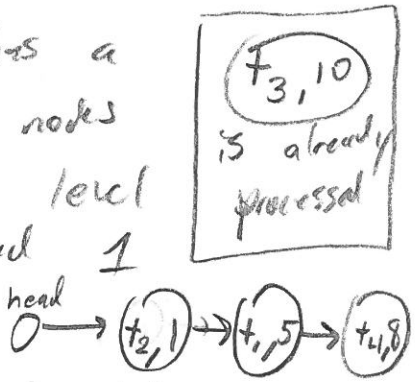
Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer 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 → First in First out if all priorities match, but higher priority is sent through first. This matches the problem.

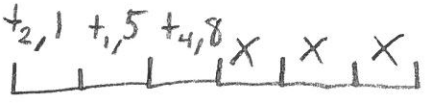
b) Describe one way in which this data structure could be implemented and draw a picture of that data structure.

Linked list of nodes. Each node has a ticket and priority value. New nodes are placed based on priority level Suppose 4 tickets came in and 1 got addressed. List looks like



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

Could have an arraylist with front as entrance and back as exit. For the same tickets as before it would look like:



w/ $t_{3,10}$ already processed.

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:

```
def numOccurances(the_string, the_char):
    numOccur = 0
    for c in the_string:
        if c == the_char:
            numOccur += 1
    return numOccur.
```

Note: I ignored error cases like wrong types or nullity.

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:

$O(k)$

Explanation of best case time complexity:

If we are lucky each new number will be smaller than the last so each addition will take $O(1)$ time.

Worst case time complexity of algorithm:

$O(nk)$

Explanation of worst case time complexity:

If we are unlucky and do not have a tail pointer in our linked list and each new number is bigger than the last we will have to iterate over the whole list each time we add. That is we do $O(n)$ k times.

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)*
Hill AFB paid internship	c/c++ networking	3 mo · 4 weeks · 40 hrs = 480
Epals	peer mentor students	4/semester x 8 weeks x 5 hrs = 160
math Tutor w/ MSC	teach math/stats	2 semester x 16 weeks x 5 hrs = 160
ACM / Hacker Cats	learn extra CS	1 semester x 8 weeks x 1 hr. = 8

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

To be honest I am not 100% sure. my guess is it's when a person puts their bias into an algorithm they write.

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

A white woman writes UI and only has selected options of:

white O
black O

for race. They excluded other races and ethnicities. Or think about how facial recognition works best for white faces... but that's more of a data problem.

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:

People can steal/copy/use snippets of code that are small relative to code base size w/o breaking copy right.

Second possible impact:

Code bases are shrunk to limit the "stealing" of code w/o allowing copyright.

Third possible impact:

New laws are made defining how small stolen code must be before copyright applies. (Like Plagiarism rules).

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:

Running people/animals over.

Second type of harm:

Crashing and injuring/killing passengers.

Third type of harm:

Crashing and destroying infrastructure like roads, other cars, poles, etc.

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 was offered a spot in Hill AFB's PMO program. I am required to work for them for 1 year. Then I get to attend their choice of 3 graduate MS in CS programs. I have applied to MSU's MS in CS only, so far.

Question 9: List any organized social activities (e.g. SwingCats, church, a residence hall volleyball team) that you were involved with during your entire time at MSU. For each activity, (1) **provide** the name of the organization, (2) **estimate** the total number of hours you spent.

Organization Name	*Estimate Total Hours Spent*
Calvary Chapel - Bozeman	2 hrs/week · 4 yrs · 52 weeks = 216 ish

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)*
Robotics made me work w/ another person.	16 weeks x 5 hrs = 80
TAing for CSCI 107	16 weeks x 5 hrs x 2 semesters = 160
Other classes...?	30 hrs over college span?

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:

organize code by time committed, tags, desc.

Non-trivial feature 2:

rewind to older (not broken) code versions.

Non-trivial feature 3:

can be shared post-establishment.

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)*
Not really – I did not have time.	
	30 hrs over whole college career.
did some coding on my own	

Best wishes wrapping up the semester and in the future!

Thanks. Also, AI and ESOF 422 are too hard probably. They do not provide great learning environments, just really tough problems. :)

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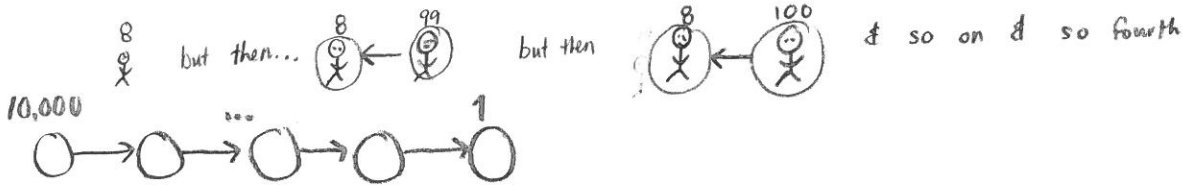
Name Racquel Bowen

Major (Circle One): Computer Science B.A. or (Computer Science B.S.)

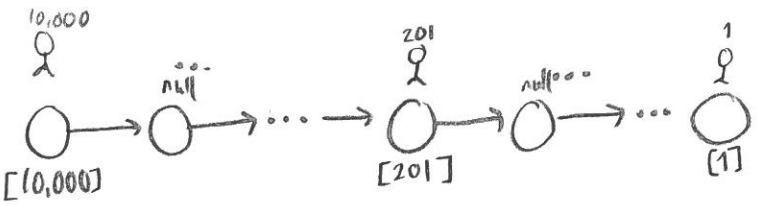
Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer 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 linked list would work well because you would be able to add urgent people to the front & non urgent people to the middle or end & it would be easy to get the next person in line.

b) Describe one way in which this data structure could be implemented and draw a picture of that data structure.
The person with higher urgency score would be placed at the index 10,000 then if someone was higher than that the previous person would be bumped down.



c) Describe a second way in which this data structure could be implemented and draw a picture of that data structure.
You could do the same thing above but a person with a high urgency score could be placed at that same index of their urgency score.



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 Language:

```
def countCharAppearance(str, c){
    count = 0
    for (char in str):
        if (char == c):
            count += 1

    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:

n^k so... n

Explanation of best case time complexity:

Since k numbers/floating numbers are being added to the list the time complexity of this must iterate through n k many times.

Worst case time complexity of algorithm:

n^{n-1}

Explanation of worst case time complexity:

k could be n-1 but it's still n^{n-1} because it has to iterate through it'self (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)*
EPals	Class time + Helping students	3 sem × 8 times × 2 hrs = 48 hrs
Undergrad CA	Helping Students + Grading	2 sem × 2 times × 7 hrs × 16 wks = 448 hrs
Hill AFB	Coding	12 wks × 40 hrs = 48 hrs
Math & Stats Center	Helping Students	2 sem × 4 hrs × 16 wks = 128 hrs

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

Oh. I have no idea.

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

Nope, I do not know.

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:

Copying or using libraries would be a no-no.

Second possible impact:

Coders would have to make their own coding libraries.

Third possible impact:

Coders would have to mark what code they wrote & heavily comment.

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:

It could harm the passengers of that vehicle if it went rogue.

Second type of harm:

It could harm other people/pedestrians or other drivers if it didn't function correctly.

Third type of harm:

People could hack the car & get data/metadata from the driver of the car, invading privacy.

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 at HAFB with their PAQ program & return to MSU to get my MS in CS paid for by/through Hill AFB.

Question 9: List any organized social activities (e.g. SwingCats, church, a residence hall volleyball team) that you were involved with during your entire time at MSU. For each activity, (1) **provide** the name of the organization, (2) **estimate** the total number of hours you spent.

Organization Name	*Estimate Total Hours Spent*
HackerCats	3 hours

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)*
NA	N.A

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:

I do not know any. I don't really even know what is.

Non-trivial feature 1:

NA

Non-trivial feature 2:

NA

Non-trivial feature 3:

NA

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)*
N.A.	N.A.

Best wishes wrapping up the semester and in the future!

Thank You!

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Name Xander Burger

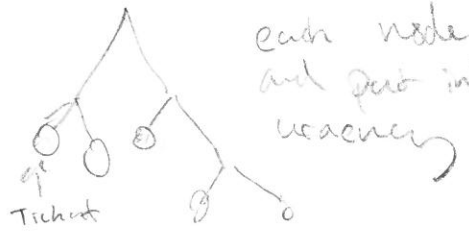
Major (Circle One): Computer Science (B.A.) or Computer Science B.S.

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 red black tree. easy to sort and Rank

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



each node is a ticket and put into the tree based on its urgency

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

you could take existing data then through it in the tree based on urgency



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:

```
def countLettersInString(string, char):
    count = 0
    For i in rang(len(string)):
        If(string[i] == char):
            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:

O(1)

Explanation of best case time complexity:

Sense the list is maintained in accendy order at worst case k is lower than the last node meany it would have to go through the whole linked list bc for it is placed

Best case it is high than every other node and placed at front

Worst case time complexity of algorithm:

O(n)

Explanation of worst case time complexity:

sense the list is maintained in accend order at worse case k is lower than every other node meany you have to go through the whole list before it is placed

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 Innovation Partnership	intern web/design	~200 hours

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

algorithms particularly machine learning algorithms which use data containing some sort of bias, leading to the further spreading of that bias.

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

Maybe you have a data set that is used Find out who the college should send emails to, but your data set only contains wealthy people and now only affluent students get emails from your college.

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:

a presadent for more open code sharing.

Second possible impact:

loose Ideahs on ownership of Code

Third possible impact:

The continuation of google using code from smaller companys for profit

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:

Hitting a pedestrian

Second type of harm:

trapping people in cars

Third type of harm:

Collection of sensative location data of users for profit

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'm going to travel, maybe work on a farm. get away from a computer for abit

Question 9: List any organized social activities (e.g. SwingCats, church, a residence hall volleyball team) that you were involved with during your entire time at MSU. For each activity, (1) **provide** the name of the organization, (2) **estimate** the total number of hours you spent.

Organization Name	*Estimate Total Hours Spent*

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 (423) Software team	180 +

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 / github

Non-trivial feature 1:
branching

Non-trivial feature 2:
CI / automated testing

Non-trivial feature 3:
Naming commits

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)*
game design with godot	500+

Best wishes wrapping up the semester and in the future!

Montana State CS Graduating Senior Exam

Academic Year 2023-2024, 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 Connor Carlson

Major (Circle One): Computer Science B.A. or Computer Science B.S.

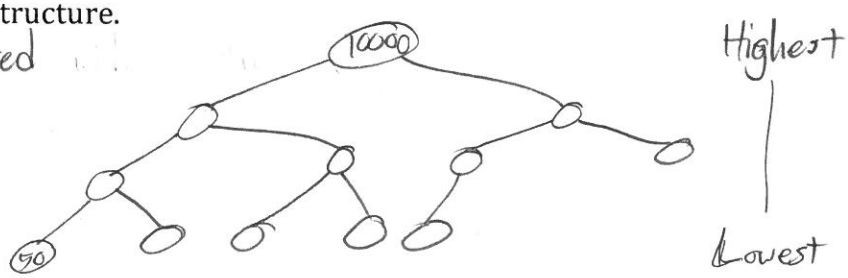
Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer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

Heap. A heap would be able to organize itself by urgency score and the customer service team would easily be able to pull the ticket with the highest urgency.

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 tree 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):

Your solution:

```
def characterCounter(word: str, letter: char) -> int:
    count = 0
    for i in range(len(word)):
        if word[i] == letter:
            count += 1
    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: No one has been able to sufficiently describe to me how timecomplexity is

Explanation of best case time complexity: appied except Sean Yaw, but when he taught it, it was more of what was meant to be a recap and it was an overall very small aspect of that class

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)*
Hacker Cats	Lectures & Presentations	15

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

Bias that is introduced in a software system by basing it on a data set that - intentionally or otherwise - neglects certain necessary variables.

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

The software could prioritize GPA from students which may only account for the actual score itself rather than the student's comparitive standing to their peers. One student may have a 3.1 GPA but come from a school with an average GPA of 2.0 while another student may have the same GPA at a school with a 3.5 average GPA. The software would view the two students equally, though the college may want to weigh these cases differently.

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:
Developers may now be more hesitant to using a premade API when developing their systems.

Second possible impact:
Innovation may be slowed in the industry due to the fear of using premade API especially ones as popular and as commonly used as Java.

Third possible impact:
More groups may look to develope their own API - a costly and lengthy process that many may not have the resources to do.

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:
Physical. Poor decision making of the autonomous system may result in traffic accidents resulting in injury

Second type of harm:
Financial. What would happen if the owner of a self-driving car calls it to come to them, as they can already do, and the car gets into an accident where the driver of the other car is not at fault? in traffic accidents a driver is usually held resposible but what happens

Third type of harm: when the driver is not in control of the vehicle
Ecinomic harm. Most self-driving cars these days are usually electric which reduces the need for fosil fuels but simultaneously the cost. For people who can't afford these cars, they are now having to pay more to support owning a cheaper vehicle.

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.

As of right now my plan is very fluid. My general plan is to continue working at the company I am currently interning at, Hoplite Industries. Right now I work as a security operations analyst for them but I am hoping to move up into their engineering team. Depending on that and how much more expensive it gets to live in Bozoman I may explore other options.

Question 9: List any organized social activities (e.g. SwingCats, church, a residence hall volleyball team) that you were involved with during your entire time at MSU. For each activity, (1) **provide** the name of the organization, (2) **estimate** the total number of hours you spent.

Organization Name	*Estimate Total Hours Spent*
Church	48

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)*
Group Projects in Chinese Class	Two Semesters

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:

Auditing

Non-trivial feature 2:

Error Checking

Non-trivial feature 3:

Collaboration

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 Several Programming Langs	80

Best wishes wrapping up the semester and in the future!

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Name Jamison Cleveland

Major (Circle One): Computer Science B.A. or (Computer Science B.S.)

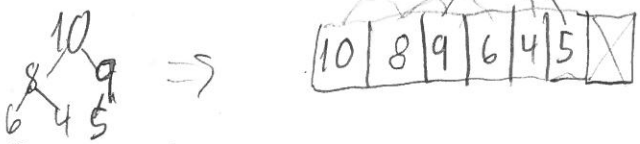
Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer 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 priority queue / max heap. The most urgent ticket would have O(1) lookup, and adding + removing tickets would be O(log n).

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

It could be implimented by using an array, with the 1st element being the head, and the left child of node i is 2i+1, and the right child is 2(i+1). All children must be less than its parent.



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

It could also be implemented using a tree, with the same heap invariant. Instead of holding elements in an array, each node holds pointers of the left and right children.

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 occurs(xs, y):
    n = 0
    for x in s:
        if x == y:
            n += 1
    return n
```

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: $O(k)$

Explanation of best case time complexity:

In the best case scenario, each new number will be less than head of the list, and each subsequent number is less than its previous. This would only require creating a new node, make it point to the head of the list, then make the new node the head. This operation doesn't concern the rest of the list, so for one number, it is $O(1)$, and $O(k)$ for k numbers.

Worst case time complexity of algorithm: $O(kn)$

Explanation of worst case time complexity:

In the worst case scenario, each new number is greater than the rest of the list, and greater than the previous insertion. This would require traversing the list, to its end $(O(n))$, then inserting the node $(O(1))$. For k numbers, and assuming $k \ll n$, the worst case is $O(kn)$.

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)*
Capital One	- coding - debugging	~300 hrs.

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

An algorithmic bias is a when a computer algorithm has a tendency to skew its results or fail to be impartial.

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

If a machine learning algorithm is trained to screen applicants based off of their information, but if that data includes information relating to their protected class, then the algorithm may give preference to students based off their protected class, and not other important qualities.

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 structure doesn't get the same licensing protections as source code.

Second possible impact:

Third possible impact:

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: It may crash and hit a pedestrian.

Second type of harm: It may perform an unsafe maneuver that may injure the occupants (braking too fast, causing whiplash).

Third type of harm: It may fail to follow traffic laws.

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'm planning to work at Capital One. I have received a full-time offer post-graduation.

Question 9: List any organized social activities (e.g. SwingCats, church, a residence hall volleyball team) that you were involved with during your entire time at MSU. For each activity, (1) **provide** the name of the organization, (2) **estimate** the total number of hours you spent.

Organization Name	*Estimate Total Hours Spent*

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)*

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: Branching + merging.

Non-trivial feature 2: Roll-backs.

Non-trivial feature 3: An immutable history.

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)*
Programming side projects	~200 hrs.?

Best wishes wrapping up the semester and in the future!

Montana State CS Graduating Senior Exam

Academic Year 2023-2024, 80 minutes.

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Name Camille Custer

Major (Circle One): Computer Science B.A. or Computer Science B.S.

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 array would be a simple way to store this data. The array is initialized at size 10,000.

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

The array is ordered a each one that's added is put in the right spot

x.insert("5")

[1, 2, 3, 4, 6, 10, 21]

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

Elements of the array can be removed

x.remove("5")

[1, 2, 3, 4, 5]

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:

```
int count;
HashSet() stringset
for char in string
    if a in word:
        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:

O(1);

Explanation of best case time complexity:

The most elements added to the list is constant K less than n and best case they are already in ascending order.

Worst case time complexity of algorithm:

O(n);

Explanation of worst case time complexity:

All of the numbers are out of order and the list needs to be sorted after each element.

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)*
AWC	officer	80
Sacks		10

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

Results/data are skewed because of coding.

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

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:

Many other companies would probably be sued

Second possible impact:

There would be a legal limit on copied lines of code for plagiarism

Third possible impact:

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:

Crashing into someone else/hurting them

Second type of harm:

Destruction of property.

Third type of harm:

Driving against the laws.

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 working at Wells Fargo as a software engineer in their early career development program.

Question 9: List any organized social activities (e.g. SwingCats, church, a residence hall volleyball team) that you were involved with during your entire time at MSU. For each activity, (1) **provide** the name of the organization, (2) **estimate** the total number of hours you spent.

Organization Name	*Estimate Total Hours Spent*

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)*
AWC	80

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:

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)*
Leetcode	10
Hack the Box	6
Youtube	12

Best wishes wrapping up the semester and in the future!

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Name Hoang Dang

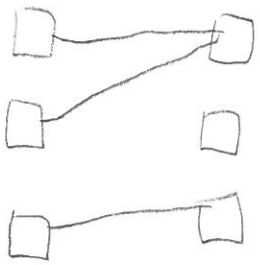
Major (Circle One): Computer Science B.A. or Computer Science B.S.

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.

Hashmap

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



Hash customers to urgency score

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

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:

```
def FOO (str, char):
  int iter = 0
  for (int i; i<str.length; i++) {
      if (i==char) {
          iter++ }
  }
  return iter
```

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:

$O(n)$

Explanation of best case time complexity:

Worst case time complexity of algorithm: $O(n^2)$

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)*
Food bank	Stocking	100+
Automattic intern	Database	100+

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

When a program systemetically creates disadvantages for certain groups

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

The software could favor the admission of certain groups

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: Overhaul of infringement policies

Second possible impact: Localized API

Third possible impact:

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: Phsical harm

Second type of harm: Corrupted learning Model

Third type of harm: Degrades general driving skills

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.

Recieved SWE offers from Automattic and Jane Street

Question 9: List any organized social activities (e.g. SwingCats, church, a residence hall volleyball team) that you were involved with during your entire time at MSU. For each activity, (1) **provide** the name of the organization, (2) **estimate** the total number of hours you spent.

Organization Name	*Estimate Total Hours Spent*
Jogging group	50+

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)*
3D printing group	10+

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: Open Source

Non-trivial feature 2: Fetch/pull

Non-trivial feature 3: Branching

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)*
Engineering workshops (NAH)	10+

Best wishes wrapping up the semester and in the future!

Montana State CS Graduating Senior Exam

Academic Year 2023-2024, 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 Tenis Dietz

Major (Circle One): Computer Science B.A. or Computer Science B.S.

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.

Array. if you size it 10,000 you can place The tickets into a Que in the index.

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

Array of Ques.



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

Hash map. each No contain a Set of tickets.



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 sCount (string, charx)
    Count =0,
    For x in range(Len (string)):
        if string.charat(x) == charx : Count += 1

    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:

O(c)

Explanation of best case time complexity:

as it will take K which is a finite ammount it can be constant ~~cost~~ as each is-it is a constant opperate

Worst case time complexity of algorithm:

O(c)

Explanation of worst case time complexity:

same as above

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)*
NA		

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

algorithms operate on unknown Data so if the Data is bad the algorithm loses accuracy

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

Say it iterates through a list of applicants and when it hits a 4.0 Gpa it accepts and terminates. Thus excluding all the 4.0s

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:

code can be use like ingredients, its Like banning SALT from Fast

Second possible impact:

End function define a program and that should be protected

Third possible impact:

if code can be copy with it will elimate the Standard of Best practice

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: it can choose to hit on person over a group of people

Second type of harm:

if used for police work it could be bias of what part of map it patrols

Third type of harm:

Can time out and crash hurting operator.

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.

Currently work @ Zoo1
going for a Developmt positia

Question 9: List any organized social activities (e.g. SwingCats, church, a residence hall volleyball team) that you were involved with during your entire time at MSU. For each activity, (1) **provide** the name of the organization, (2) **estimate** the total number of hours you spent.

Organization Name	*Estimate Total Hours Spent*
NA	
Work and Family	

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)*
No Activitys	

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 hub

Non-trivial feature 1:

Colaberation

Non-trivial feature 2:

integration int IDE

Non-trivial feature 3:

Accesabilty on Web.

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)*
NA	

Best wishes wrapping up the semester and in the future!

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Name Joseph DiPrizio

Major (Circle One): Computer Science B.A. or (Computer Science B.S.)

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, we keep track of all tickets and can assign priority to VIPs

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

FIFO Stack, implemented in an array list



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

Directed linked 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): Java

Your solution:

```
private int getCharCount(string x, char c){
  int count = 0;
  For Char a in X{
      if(a == 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:

$O(k)$

Explanation of best case time complexity:

all added k numbers are already in order and less than the smallest n number. This means they are all added at beginning of linked list.

Worst case time complexity of algorithm:

$O(nk)$

Explanation of worst case time complexity:

We have to traverse the list of size n for each element k. Adding to the end of the list

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)*
Debate at Montana State	founder, debating, judging	600-700 hours
Philosophy Club	president, meetings	50 hours
Chess club	playing chess	5 hours

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

Bias present in an algorithm, either exclusionary or inclusionary,

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

Algorithm bias could take place by rejecting students from lower income areas since those students would often be engaged in less extracurricular activities.

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 code is protected use

Second possible impact:

Public domain / open source code is fair use

Third possible impact:

A string of lawsuits doesn't follow from Oracle winning that target many software devs.

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:

running people over, damage from accidents

Second type of harm:

slow driving, rider loses time

Third type of harm:

congests traffic, other drivers lose time

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 on pursuing game development. I will probably work remotely on this. If that doesn't work out I will do software dev on something while creating my own videogames solo.

Question 9: List any organized social activities (e.g. SwingCats, church, a residence hall volleyball team) that you were involved with during your entire time at MSU. For each activity, (1) **provide** the name of the organization, (2) **estimate** the total number of hours you spent.

Organization Name	*Estimate Total Hours Spent*
Spire climbing gym	100 hours
DND	1,000 hours
Blood donations?	8 hours

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)*
Debate / Judging debate	600 - 700 hours
Philosophy discussions/club	50 hours
Group projects	30 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: pip?

Non-trivial feature 1:

It tells me I need to update things

Non-trivial feature 2:

It lets me ignore these warnings

Non-trivial feature 3:

Incredibly easy install of packages

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)*
Creating Youtube videos	40-60 hours
Unity / Unreal Engine 5	30-50 hours
Net pron	20 hours

Best wishes wrapping up the semester and in the future!

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Name Ryan Dwyer

Major (Circle One): Computer Science B.A. or (Computer Science B.S.)

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.

* while loop cycling through a list of scores ranging through 1- 10,000 and then removing it.

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

while (list ≤ 1)

this.remove (score)

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

while (list ≥ 10,000)

this.remove (score)

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:

```
import Scan Scanner

Class find Charcter

for ( i in S ):
  if ( C in S ):
    C + 1
      return C
C = Charcter
S = Strings

Class main
  Print (What is your word;)
Scan (user. input)
  Print ( What Character are you looking for;)
Scan (user. input)
  Print ( " your Character appears : Counter "times")
```

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:

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)*
Zoot	Work	1000
Alpha sigma phi	fraternity	1,000
Montana Dancathon	Dancathon	36
	Scuba Diving	300

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

A bais for algorithms

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

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:

Gate keep code so no one can use it

Second possible impact:

People Hate google affecting stocks,

Third possible impact:

much harder to get open source 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: making to tight of turn on a road hitting a person

Second type of harm: running a red light / stop sign

Third type of harm: going above fenoloy levels in a School zone.

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 on working in a Cyber Security Position at Zoot enterprize. Then start up a tech support company.

Question 9: List any organized social activities (e.g. SwingCats, church, a residence hall volleyball team) that you were involved with during your entire time at MSU. For each activity, (1) **provide** the name of the organization, (2) **estimate** the total number of hours you spent.

Organization Name	*Estimate Total Hours Spent*
Alpha Sigma Phi	1,000

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)*
Scuba diving	300

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:

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)*
Hack the box	24
W3 School learning	18

Best wishes wrapping up the semester and in the future!

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Name Alex Du Bois

Major (Circle One): Computer Science B.A. or (Computer Science B.S.)

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.

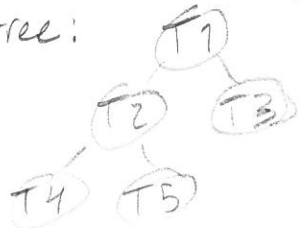
ArrayList of Tickets sorted by Urgency
- Can easily add/remove tickets and sort

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

[Ticket object - Urgency, description, user, etc]
[Ticket1, Ticket2, Ticket3 ...]
Sorted ArrayList of objects

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

The ArrayList could also represent a tree:



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 static int CountChars(String str, char ch) {
    int numChars = 0;
    int strLen = str.length();

    for (int i = 0; i < strLen; i++) {
        if (str.charAt(i) == ch) {
            numChars++;
        }
    }
    return numChars;
}
```

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:

$O(k)$

Explanation of best case time complexity:

As Every number is added, it is already in ascending order and does not need to be rearranged - the value is only compared to the first element of the linked list.

Worst case time complexity of algorithm:

$O(k \cdot n)$

Explanation of worst case time complexity:

Every number is added to the beginning but belongs to the end, so it must be compared to every other element.

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)*
AWC	Board Member	2-3hrs/wk
ACM	Attended meetings	1hr/wk
Liberty Mutual Intern	Paid intern	40hrs / 11 wks

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

Bias inherent in and perpetuated by algorithms.

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

An algorithm could have been trained on previous admission data in which mainly people with typically Male names were admitted - it then might give preferential treatment to people with those kinds of 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: Oracle

First possible impact:
Potential concerns on what is copyright/patent infringment - how much code/how unique?

Second possible impact:
Use of more variety of languages to avoid accidental infringement

Third possible impact:
?

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:
Physical Harm - it hits someone

Second type of harm:
Emotional Harm - someone in the car watches it hit someone

Third type of harm:
Financial Harm - it drives into a house and causes damage that needs to be paid for

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.

Accepted Job offer programming for Liberty Mutual ("TechStart Full-Time")

Question 9: List any organized social activities (e.g. SwingCats, church, a residence hall volleyball team) that you were involved with during your entire time at MSU. For each activity, (1) **provide** the name of the organization, (2) **estimate** the total number of hours you spent.

Organization Name	*Estimate Total Hours Spent*
Association for Women in Computing	2hr/wk

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)*

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:

Branching

Non-trivial feature 2:

Collaboration w/ Multiple users

Non-trivial feature 3:

Ability to restrict and grant access to users

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)*
Club Activities - whiteboarding, networking, workshops, etc	3hr / week

Best wishes wrapping up the semester and in the future!

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Name Yabets Ebren

Major (Circle One): Computer Science B.A. or Computer Science B.S.

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 graph

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

- Higher priority tickets, placed higher on graph, When completed, remove and replace.

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

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:

```
def num_characters(string, character):
    number = 0
    for character in string:
        number += 1

    return number
```



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:

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)*

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

When the dataset or source code of the algorithm have a bias

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

If the software is biased towards admiting / rejecting based of Gender or race.

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:

- open source availability

Second possible impact:

- more complex laws

Third possible impact:

—

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:

- physical harm

* faulty - may cause accidents.

Second type of harm:

- privacy harm.

Third type of harm:

* Environmetal harm,

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.

NA

Question 9: List any organized social activities (e.g. SwingCats, church, a residence hall volleyball team) that you were involved with during your entire time at MSU. For each activity, (1) **provide** the name of the organization, (2) **estimate** the total number of hours you spent.

Organization Name	*Estimate Total Hours Spent*

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)*

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

Only used Git

Name of most sophisticated version control system:

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)*

Best wishes wrapping up the semester and in the future!

You too!

Montana State CS Graduating Senior Exam

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Name Dustin Edgerton

Major (Circle One): Computer Science B.A. or Computer Science B.S.

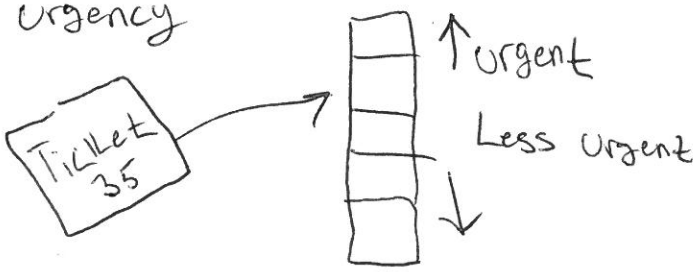
Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer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

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

Put the ticket in the que based off of the urgency



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

Que, Sort the tickets before you put them in ie 1000 goes on bottom



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:

```
Str = Thisexamsssilly
Chr = i
Count = 0
for Chr in Str:
    if Chr = Str[Chr]:
        Count=1+Count

Print(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: O(n)

Explanation of best case time complexity:

honestly just guessing I haven't thought about time complexity since I was a freshman 5 years ago

Worst case time complexity of algorithm: $O(n)^2$

Explanation of worst case time complexity:

Same as above

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)*
CySER	cyber security discussions	3-5 hours/week
AirCats	Learning to Lead	20-25 hours/week

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

When a algorithm shows unwanted bias towards a specific group

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

Hypothetically: The algorithm could show bias towards straight white males from the Middle class because they wouldn't stand out in any special way

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: Big tech can't stomp around on other companies as easily

Second possible impact: Companies might start being way more secretive and stop releasing as much open source

Third possible impact: Oracle becomes mega rich and Google stops providing it's services

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: Not recognize a person in the road and kill them

Second type of harm: thing someone is in the road and lock up the breaks and cause a wreck

Third type of harm: Confuse it's location and drive you off a bridge

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 am commissioning into the Airforce and will be going to Texas right after graduation

Question 9: List any organized social activities (e.g. SwingCats, church, a residence hall volleyball team) that you were involved with during your entire time at MSU. For each activity, (1) **provide** the name of the organization, (2) **estimate** the total number of hours you spent.

Organization Name	*Estimate Total Hours Spent*

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)*
Air Force ROTC	20-25 hours/week

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

Name of most sophisticated version control system: [redacted] IntelliJ

Non-trivial feature 1: [redacted] Code completion ([redacted] that actually works)

Non-trivial feature 2: Debugging tools

Non-trivial feature 3: Can jump to a class using alt click (specific spot in code)

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)*

Best wishes wrapping up the semester and in the future!

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Name Gabriel EWSyk

Major (Circle One): Computer Science B.A. or Computer Science B.S.

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.

Sorted Linked List

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

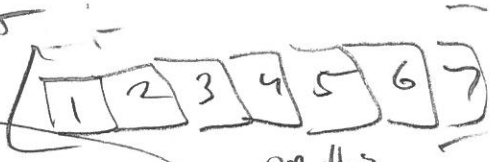
Using nodes and pointers and implementing a sort method that handles proper insertion



take first item off by setting dummy to next till

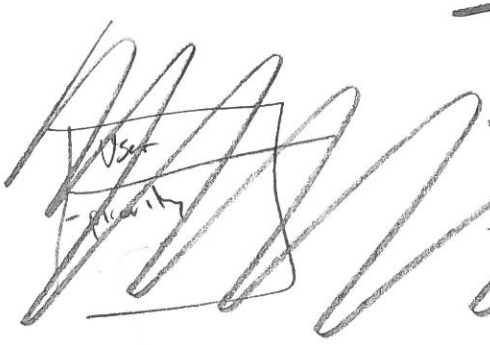
c) Describe a second way in which this data structure could be implemented and draw a picture of that data structure.

or a bubble sorted List



pop this from the list when you want to ex

A Database with sorting and organization



Select FROM User where priority Sorted on urgency priority Limit 10 thru de

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~~ pseudo code

```
str String = "xyz"
int iNteger = 0
for x in string
    x+=1
print 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:

1

Explanation of best case time complexity:

if it is the largest number then we only have to check the first number of the already sorted

Worst case time complexity of algorithm:

n

Explanation of worst case time complexity:

it : it has to go through all items and check it in the list it will be n number of nodes

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)*
Lark Id	Internship	1,000 hrs

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

an algo that uses biased data to be important data to come to a conclusion that may be inaccurate

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

An algo that only uses test scores and GPA to admit but fails to consider factors like state, ethnicity, background

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:

First possible impact:

Leads to more open source code practices

Second possible impact:

Oracle loses licensing money on their code

Third possible impact:

Google follows suit and makes code community friendly and open source

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:

Code does not handle all edge cases leading to system failure and injury

Second type of harm:

Code is not properly tested and loaded and results in faulty dangerous product

Third type of harm:

Illegally becomes reliant on self driving cars and their custom OS can only be built on by the creator

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.

Work at Land Id

↳ have received offer

Applied to Workiva, Intel, Microsoft

Oracle

Question 9: List any organized social activities (e.g. SwingCats, church, a residence hall volleyball team) that you were involved with during your entire time at MSU. For each activity, (1) **provide** the name of the organization, (2) **estimate** the total number of hours you spent.

Organization Name	*Estimate Total Hours Spent*
MSV Hurlcats	3 hrs

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)*
Internship	1000 hrs
Personal Business	500 hrs

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's dependabot

Non-trivial feature 1:

Update old packages through PRs

Non-trivial feature 2:

Lists vulnerable dependencies

Non-trivial feature 3:

Updates old code to reflect new changes in 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)*
AWS Cloud Architect	80
Personal Business Project	500
Code Youtube Vids	100

Best wishes wrapping up the semester and in the future!

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Name Jadeyn Fincher

Major (Circle One): Computer Science B.A. or Computer Science B.S.

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.

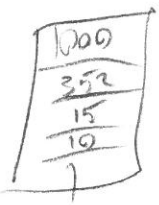
Priority Queue

Urgency = priority

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

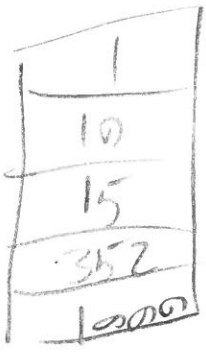
The higher the urgency the more towards the top of the stack the item would go

10
15
352
1
10000



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

reverse it and the priority values



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): Typescript

Your solution:

```
Const CharCount = (string:string, char:string) =>{
    let Count = 0
    (...string).forEach(e=>{
        if(e===char){
            Count = count+1
```

3 3

3

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(K)

Explanation of best case time complexity:

ascending

If all of k is sorted and all items in k are greater than the first entry in n then we will just always append to the front

Worst case time complexity of algorithm: O(k*n)

Explanation of worst case time complexity:

If all of k is sorted desc and all items in k are less than the first entry we will have to go through each element in k, n times

6.5
30

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)*
Quiq	Paid internship	800
Hackercats	Meeting	2

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

An algorithm that has encoded bias toward any group.

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

If we took some group that has not done well in the past and trained the software on how to predict if they will do well or not and base admissions on that, we would see it disproportionally not admit that group

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:

Copy and pasting code becomes illegal

Second possible impact:

Chat gpt responses could be owned by microsoft

Third possible impact:

Harder to find solutions quickly

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:

Physical, car drives into someone

Second type of harm:

Mental, car drives into someone, making them fear that type of car

Third type of harm:

~~Galahat~~, car learns only in one dataset in one country and

Financial, car could drive into someone and cause medical damage and car damage

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'll be working at Quiq. Recieved and accepted an offer.

Question 9: List any organized social activities (e.g. SwingCats, church, a residence hall volleyball team) that you were involved with during your entire time at MSU. For each activity, (1) **provide** the name of the organization, (2) **estimate** the total number of hours you spent.

Organization Name	*Estimate Total Hours Spent*
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)*
None	

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:

Only one that I use: git

Non-trivial feature 1: git stash

Stashes changes on a stack and reverts branch to master

Non-trivial feature 2: git pop

Grabs the top of the stash stack and applies the diff to the branch

Non-trivial feature 3: git diff

Shows line by line differences between Master and the uncommitted 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)*
Learning Batch (as a kid)	30

Best wishes wrapping up the semester and in the future!

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Name Robert Grad

Major (Circle One): Computer Science B.A. or Computer Science B.S.

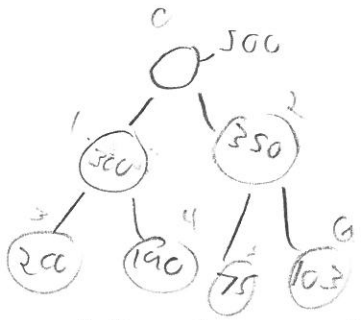
Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer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

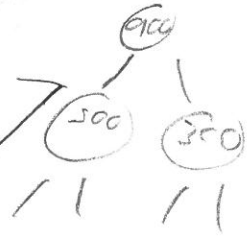
Max Heap based on urgency level
New tickets enter and are inserted at the bottom of the heap. Highest urgency rises to the top

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

Binary tree



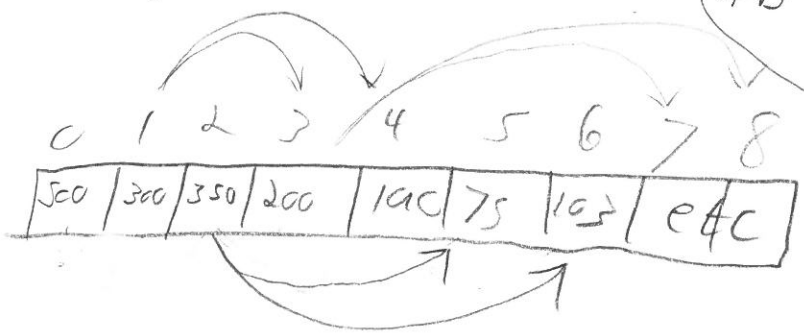
add new ticket with urgency of 400



Just pop top to work on most urgent ticket

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

1D array of tickets



Children = 2n+1 and 2n+2

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: Java

```
Def int function1(char char, &String Strin){
    iter = String.length();
    num = 0;
    for(i=0; i++; i ≠ iter){
        if char == Strin[i]{
            num += 1;
        }
    }
    return num;
}
```

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:

$O(k)$

Explanation of best case time complexity:

each number added is smaller than the smallest number of the list

just k adds, no itterating through the list.

Worst case time complexity of algorithm:

$O(k \cdot n)$

Explanation of worst case time complexity:

each number is bigger than the biggest numbre in the list

must iterat over n items k times

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.

I dont know what that is

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

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 (not that i like Google)

First possible impact:

language APIs become more widely available

Second possible impact:

People may stop investing resources into developing these APIs

Third possible impact:

more variety of API's become available

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:

Physical harm (hitting some one)

Second type of harm:

financial harm

(Costing the owner/drivers money if software malfunctions)

Third type of harm:

It could scare users by either not listening to instruction or driving to aggressively.

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 out of state but i havent applied any where yet.

Question 9: List any organized social activities (e.g. SwingCats, church, a residence hall volleyball team) that you were involved with during your entire time at MSU. For each activity, (1) **provide** the name of the organization, (2) **estimate** the total number of hours you spent.

Organization Name	*Estimate Total Hours Spent*
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)*
rodder for archipellago	500

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:

I know ive learned about this but i cant remember what this mean right now

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)*
many personal projects	5000
(game / web development)	

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Name JoShua Green

Major (Circle One): Computer Science B.A. or Computer Science B.S.

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, more important tickets could be placed higher in the Queue and would therefor be solved sooner

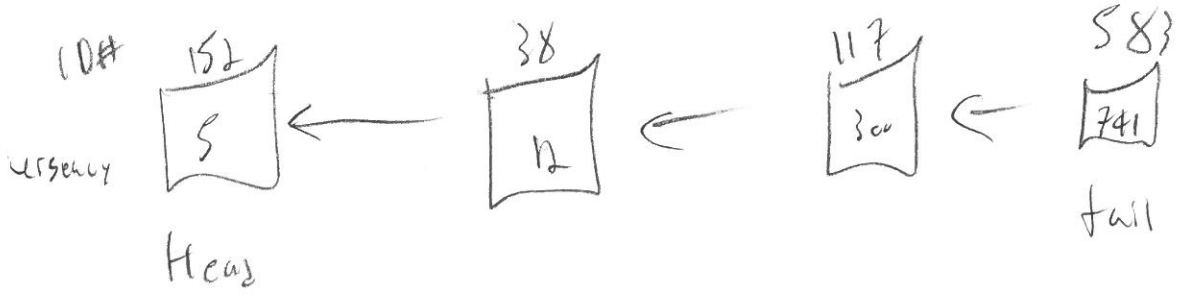
b) Describe one way in which this data structure could be implemented and draw a picture of that data structure.

a simple 2D array could be used like: [ticket ID, urgency]

ID #	152	38	117	583
urgency	5	12	300	741

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

A linked list could be used



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

```
main():
    num_times(string, c)
```

```
num_times(s, c):
    n = 0
    for i in s:
        if (i == c):
            n += 1

    return(n)
```

```
main()
```

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:

best case the first element of the list is the place it should go, therefor the time complexity is 1.

Worst case time complexity of algorithm:

O(n)

Explanation of worst case time complexity:

worse case the it with needs to be placed at the end we therefor must itterate through the whole list before finding where it goes.

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)*
AwC	Socializing	1 hr a week
Acm	Professional dev	3 hrs a week
Hacker Cats	Teaching	3 hrs a week
Robo cats	Computer vission	1 hr a week
Chess Club	Chess	2 hrs a week
Cattracks programmer	programming PHP	15 hrs a week

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

Algorithmic bias is when a personal or implicit bias manipulates the way an algorithem preforms an action.

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

A simple example would be if an algorithem used GPA to determine if a student would be a good fit for the university. This system might cause an bias where It selects students based on race as a certain race has a higher GPA.

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:

Large Companys can no longer take Code without permission.

Second possible impact:

programers may become more hesitant to work on open Source projects

Third possible impact:

Companys may be less willing to [redacted] built upon projects.

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:

physical. Failer of the System could lead to physical harm in a crash.

Second type of harm:

Moral harm.
[redacted]. Just like the trolly problem, It might [redacted] take [redacted] away the ethical Choices of the passagers.

Third type of harm:

[redacted] Employment harm
· Self Driving Cars Could take [redacted] away Jobs from taxi drivers.

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 on pursuing a Career in Cyber Security. I Am currently applying for IT jobs here in Montana. but will likely move to the east ~~coast~~ Coast in persuit of a Goverment job.

Question 9: List any organized social activities (e.g. SwingCats, church, a residence hall volleyball team) that you were involved with during your entire time at MSU. For each activity, (1) **provide** the name of the organization, (2) **estimate** the total number of hours you spent.

Organization Name	*Estimate Total Hours Spent*
AWC	100
ACM	150

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)*

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:

Branching

Non-trivial feature 2:

~~Staging~~ Stashing.

Non-trivial feature 3:

forking

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)*
ACM	100
AWC	150
Hacker cats	100

Best wishes wrapping up the semester and in the future!

Thank you

Montana State CS Graduating Senior Exam

Academic Year 2023-2024, 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 Ryan Gross

Major (Circle One): Computer Science B.A. or Computer Science B.S.

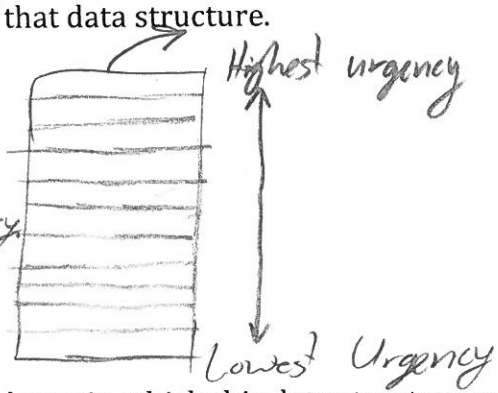
Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer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

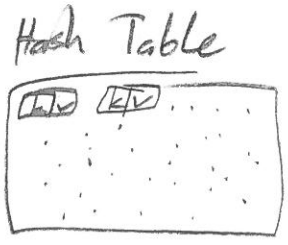
b) Describe one way in which this data structure could be implemented and draw a picture of that data structure.

This could be implemented by adding items to the queue based on urgency. (FIFO)



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

This could also be implanted with a hash table where key = customer ID and value = urgency score. Then search for highest value.



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:

```
def countChar(string_var, char_var):
    count=0
    for i in range(len(string_var)):
        char= string_var[i]
        if char == char_var:
            count++
        i++
    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:

$O(k)$

Explanation of best case time complexity:

k items are being linearly added to a linear list

Worst case time complexity of algorithm:

$O(k)$

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)*
MSU Intramural	Dodgeball	10
MSU Outdoor Rec	Snowboard Wax	10

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

404

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

404

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:

Reinforce open-source software

Second possible impact:

Allow Google to maintain operation of their mobile platform OS

Third possible impact:

Prevents Oracle from further monopolizing

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:

Harm passenger

Second type of harm:

Harm pedestrian

Third type of harm:

Destroy 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.

I have applied to many entry level software engineering positions. I have not received any offers.

Question 9: List any organized social activities (e.g. SwingCats, church, a residence hall volleyball team) that you were involved with during your entire time at MSU. For each activity, (1) **provide** the name of the organization, (2) **estimate** the total number of hours you spent. See q4

Organization Name	*Estimate Total Hours Spent*

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)*
Working @ Bridger Brewing	2,000

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:

status - shows what changes have been made

Non-trivial feature 2:

pull - pulls changes to repo from upstream branch

Non-trivial feature 3:

push - push changes to upstream repo/branch

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)*
Online programming courses	10

Best wishes wrapping up the semester and in the future!

Montana State CS Graduating Senior Exam

Academic Year 2023-2024, 80 minutes.

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Name Treyton Grossman

Major (Circle One): Computer Science B.A. or Computer Science B.S.

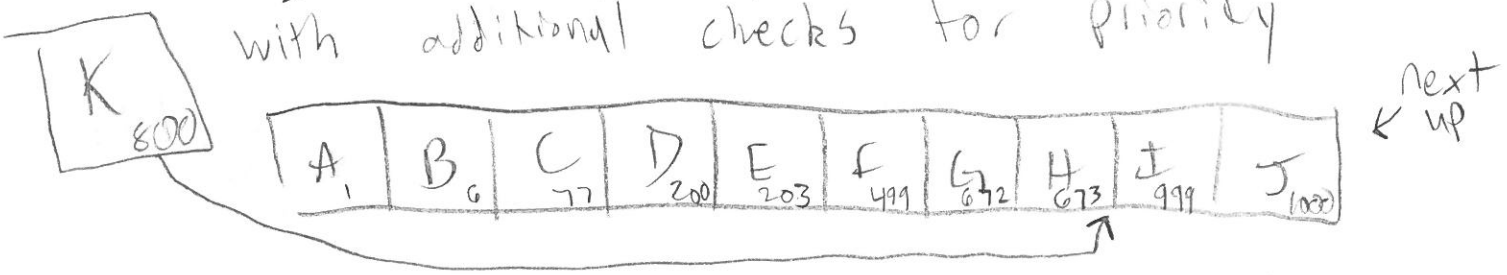
Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer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

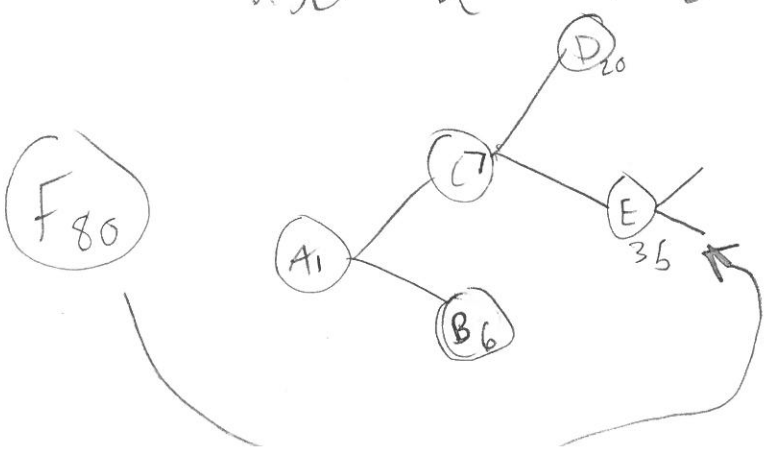
b) Describe one way in which this data structure could be implemented and draw a picture of that data structure.

It would be implemented similar queue but with additional checks for priority



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

Use a tree



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 charInString(String string, char character)
    int hits = 0
    for (char c : string)
        if (c == char)
            hits ++
    return (hits)
```

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(k)

Explanation of best case time complexity:

All added numbers are in order and the largest number is smaller than the smallest in the LL.

Worst case time complexity of algorithm:

O(n·k)

Explanation of worst case time complexity:

Each number is out of order but are all bigger than any number in the LL

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)*
Literally none	nothing	0

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

When an alogrithm has an unintended bias toward a certain result

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

It could accept a disproportionate amount of upper-class students since they tend to have better access to resources and thus have higher GPA

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:

Better access to tools

Second possible impact:

Less IP for code

Third possible impact:

Higher DRM protections

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:

Bodily harm - run someone over

Second type of harm:

Privacy infringement - listening to convos

Third type of harm:

Ethical impact - job losses for drivers

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 get a job.
I have had no offers

Question 9: List any organized social activities (e.g. SwingCats, church, a residence hall volleyball team) that you were involved with during your entire time at MSU. For each activity, (1) **provide** the name of the organization, (2) **estimate** the total number of hours you spent.

Organization Name	*Estimate Total Hours Spent*
None	0

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)*
None	0

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:

Commit messages

Non-trivial feature 2:

Commit history

Non-trivial feature 3:

Collab compatibility

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)*
learning Unreal Engine	20

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Name Amanda Gwillard

Major (Circle One): Computer Science B.A. or (Computer Science B.S.)

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 probably use a priority queue which would allow the "tickets" with higher priority to be higher in the queue

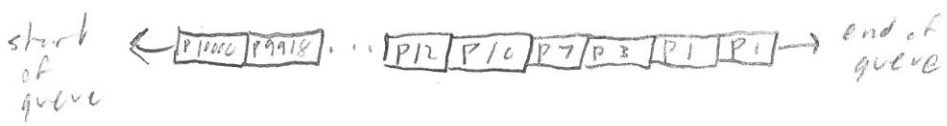
b) Describe one way in which this data structure could be implemented and draw a picture of that data structure.

Each "ticket" object could have a "priority" value attached to it. As "tickets" enter at the end of the queue, they would move higher until the tickets ahead have an equal or higher priority and the tickets below have lower priority.



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

A second way could be if 10,000 is the highest priority and 1 is lowest. That way, it would be a similar implementation, but with each ticket moving up the queue until the tickets above have an equal or bigger priority and the tickets below have a smaller priority.



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 countCharInString(String word, char letter) {
    int letterCount = 0;
    for (int i = 0; i < word.length(); i++) {
        if (word[i].equals(letter)) {
            letterCount++;
        }
    }
    return letterCount;
}
```

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: k

Explanation of best case time complexity:

The best case time complexity is that all of the added k numbers are sorted in ascending order so that all of them can just be added to the end of the linked list one by one, which would be "k" time where k is the number of additional numbers.

Worst case time complexity of algorithm: $kn = n$

Explanation of worst case time complexity:

The worst would be if the entire linked list of n numbers had to be searched every time a number was added. That would be searching through n k times, kn, which would just be n since there are no constants.

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)*
AWC	Treasurer, member	115
ACM	member	20
WIE	member	20
TechLink intern	Worked in lab	500
GSOC Office Assistant	Answered emails, helped students, etc	250

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

Algorithmic bias is when bias is written into code that affects some users and not others, aka the code is "biased". Ex. face detection AI being trained on white faces and not working as well on darker complexions.

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

This is a very extreme example, but if a college had AI screen their received applications to see if requirements were met, then the AI could prioritize certain applications due to race, gender, country of origin, etc based on the data the AI was trained on.

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:
Difficult for developers to expand on already existing code.

Second possible impact:
Could set a precedent allowing for other developers to sue each other for using small sections of code, can be hard to prove exactly who wrote what.

Third possible impact:
Developers may have to write most everything from scratch to avoid being sued.

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:
Car drives off a cliff, all occupants die.

Second type of harm:
Car won't drive due to error, occupant can't get where they need to go.

Third type of harm:
Car isn't wheelchair accessible, limiting use to many people who may want to use it.

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 working in the Space Sector at Northrop Grumman in Roy, Utah. I will be starting that position in late August. I will be in an Associate Software Engineer position. I have thought about attending graduate school, but that would probably be in more than a year.

Question 9: List any organized social activities (e.g. SwingCats, church, a residence hall volleyball team) that you were involved with during your entire time at MSU. For each activity, (1) **provide** the name of the organization, (2) **estimate** the total number of hours you spent.

Organization Name	*Estimate Total Hours Spent*
AWC	115
WIE	20
MSU Movie Club	50

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)*
AWC, works with lots of students	115

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:

Pushing to / pulling from repository

Non-trivial feature 2:

Clone an existing repository

Non-trivial feature 3:

Stashing changes before switching branches

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)*
Github workshop	1
Varias tech Networking Night Speakers	3

Best wishes wrapping up the semester and in the future!

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Name Jacob A. Hargiss

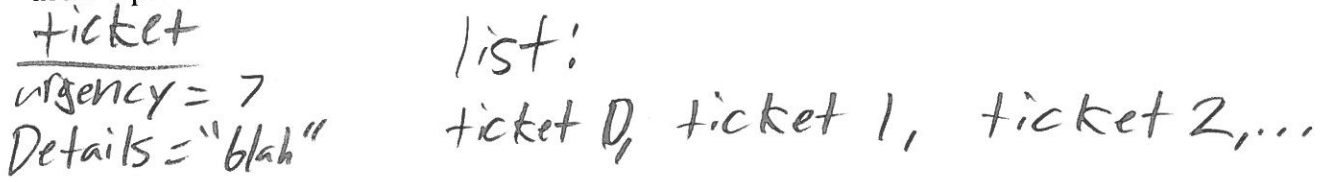
Major (Circle One): Computer Science B.A. or (Computer Science B.S.)

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.

sorted list. each ticket will be its own element in the list containing its urgency score as well as other useful information

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



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

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:

```
private int function (String input, char c){
    int count = 0;
    for(int i=0, i< input.length, i++){
        if(C = input.charAt(i)){
            count++;
retarn 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:

k

Explanation of best case time complexity:

if each element in k is less than each element n, and they are added in descending order, it will only take k iterations to complete

Worst case time complexity of algorithm:

kn

Explanation of worst case time complexity:

for each element being added, n elements will have to be seached

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)*
	Work	40 / week

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

no clue

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

no clue

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: oracle gets more money

Second possible impact: Google must pay for the use of the code in the past

Third possible impact: Google either liscences that code from oracle, replaces it with their own, or stops distributing their OS that uses it

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: might put drivers at risk

Second type of harm: might put other vehicles at risk

Third type of harm: might put pedestrians at risk

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 keep my current job until my critical debt is paid. then I plan to look for opportunities elsewhere. I am unsure of more specifics

Question 9: List any organized social activities (e.g. SwingCats, church, a residence hall volleyball team) that you were involved with during your entire time at MSU. For each activity, (1) **provide** the name of the organization, (2) **estimate** the total number of hours you spent.

Organization Name	*Estimate Total Hours Spent*

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)*
Work	40 hours / week

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: allows versions to branch from the main branch

Non-trivial feature 2: can merge branches

Non-trivial feature 3: records history

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)*
did a lot of prototype design work	300+ hours
learned fusion 360	100+ hours

Best wishes wrapping up the semester and in the future!

Montana State CS Graduating Senior Exam

Academic Year 2023-2024, 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 Josh Harvey

Major (Circle One): Computer Science B.A. or Computer Science B.S.

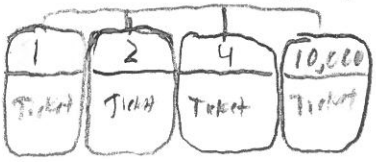
Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer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

Assuming urgency scores are unique, I'd suggest a hashmap, as it has incredibly fast lookup. Otherwise a queue would do well since you can prioritize the order.

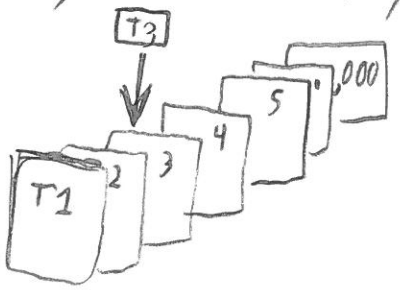
b) Describe one way in which this data structure could be implemented and draw a picture of that data structure.

hashcode = urgency score (assuming unique values)
Value = Ticket



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

assuming not unique urgency scores we can use a 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):

Your solution:

```
integer  getNum(str, ch):
         tot = 0
         for i in str:
             if i == ch:
                 tot += 1
         return tot
```

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:

Ok

Explanation of best case time complexity:

execute steps for the first k values since they can first in processing over last k links to first N

Worst case time complexity of algorithm:

On^k

Explanation of worst case time complexity:

each k value is at the last checked point, where we need to iterate over n K times.

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)*
Data...	ITSE intern	~ 640
Chi Alpha	Attending	~80

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

algorythmic bias is when a computer is designed without considering all potential users and therefore disadvantages some of them

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

lets say you use AI to analyze the grammar of an essay this AI was not trained on data from non english languages so when presented an essay written in Spanish it automatically rejects it.

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:

Without code property, Paid servers begin to fail as their code is scraped and resold directly.

Second possible impact:

Tools like inspect element cease to exist, and software is designed to make seeing its code impossible.

Third possible impact:

Cloud based solutions gain incredible usage with companies taking in data running proprietary code on servers and returning answers instead of running locally.

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:

The car may run people over.

Second type of harm:

The car may waste energy on less efficient routes

Third type of harm:

The car may provide personal information of its users daily habits to unknown parties

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 intend to move to full time self employed work as a software engineer, subcontracting for BIRS

Question 9: List any organized social activities (e.g. SwingCats, church, a residence hall volleyball team) that you were involved with during your entire time at MSU. For each activity, (1) **provide** the name of the organization, (2) **estimate** the total number of hours you spent.

Organization Name	*Estimate Total Hours Spent*
Church	150
Chi alpha	80

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)*

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:

Merging

Non-trivial feature 2:

Multi device synchronization

Non-trivial feature 3:

automated testing

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)*
Power platform PL 900	20
Quickbase Builder Certification	60

Best wishes wrapping up the semester and in the future!