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 Kelby Abel

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

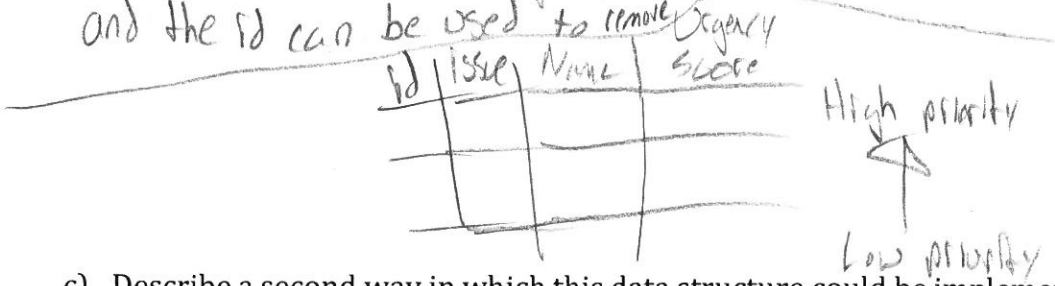
Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer 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 multiple things can be stored including urgency score, name, etc. The urgency score would determine where it was in the queue

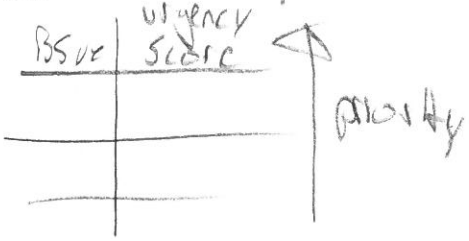
b) Describe one way in which this data structure could be implemented and draw a picture of that data structure.

The name, issue, urgency score, etc can be set and the id can be used to remove



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

The highest urgency score is completed first and then removed



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:

```
func myFunc(string, character);
count = 0
for i in string:
    if i = character:
        cant++
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(n)

Explanation of best case time complexity:

The best case time happens linearly and will happen in O(n) time. Every k will be added in the same amount of time as there are n's

Worst case time complexity of algorithm:

O(2n)

Explanation of worst case time complexity:

The time will happen at twice the amount of n's

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.

Algorithms work differently based on inputs and this can cause bias.

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

The software could see a low GPA and remove the student from potential students, but doesn't take into account for better grades in their last year of school.

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:

Google is prevented from becoming a monopoly

Second possible impact:

Oracle sets a precedent that reusing code is not okay even if there is only one way to do it.

Third possible impact:

Google could create their own programming language that would revolutionize coding forever

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 first harm is getting into a crash and creating casualties

Second type of harm:

The next harm is setting a precedent that self driving is incredibly safe, when it might not be.

Third type of harm:

The next harm could be running over pedestrians

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.

Plan to work, haven't applied

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
specifically Github

Non-trivial feature 1:

Alerts to outdated and potential security risks

Non-trivial feature 2:

Forking a repository to make it your own

Non-trivial feature 3:

Licensing

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 Andrew Anselmo

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.

An array. Its simple, easy to sort, and you can look things up, and delete easily

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

```
tickets = [500, 600, 700, ...]
tickets.append [(new score)]
tickets.remove [(old score)]
```

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

A sorted 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):

Your solution:

```
def fun(string, chr):
    count = 0
    for(i in string):
        if i == chr:
            count += 1
    return count

fun("cat", "c")
```

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:

You have to search the list till you find where to insert it, best case would be you get to insert it at the front

Worst case time complexity of algorithm:

O(n)

Explanation of worst case time complexity:

worst case is you insert it all the way at 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)*
B.I.W	Paid internship	Summer 2022 (40 hr weeks)

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

~~Favoring~~ when an algorithm makes decisions against the developers intensions because they were not specific enough.

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

Favoring canidates by quantitative data instead of qualitative. Or maybe some algorithm puts certain applications towards the top based on recognition of keywords.

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 published online is considered open source

Second possible impact:

would require companies to be more intentional with what they choose to publish online

Third possible impact:

People would be more cautious about uploading sensitive 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:

Not following traffic laws

Second type of harm:

Killing other drivers

Third type of harm:

Killing passengers

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 want to set some time aside to study for interviews post grad. I want to get a remote software engineering job (not with a specific company). I have applied no 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*

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:

cloning 3rd party developers code to my local environment so I can play with it.

Non-trivial feature 2:

making new branches and making sure they work before merging them with the main branch

Non-trivial feature 3:

Using resets to undo additions that may have broken code in the main 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)*
Cracking the coding interview	20 hours
Independent research	20 hours
Leetcode	5 hours

Best wishes wrapping up the semester and in the future!

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Name Brady Ash

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.

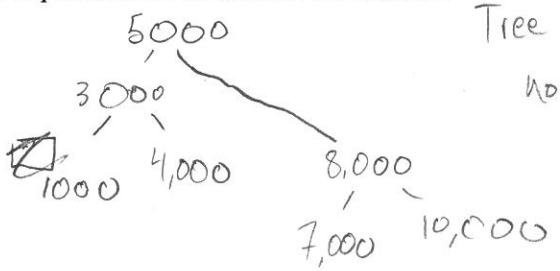
An array of tickets, sorted from highest to lowest on urgency score. This would be the easiest b/c the first entry would be the most urgent, and it is

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

[9,000, 8,073, 4, 2, 1]

Use a binary search to find the index where it should go, and insert the element there

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



Tree structure, where the rightmost node is the most urgent!

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 char_occur(str, letter):
    count = 0
    for x in str:
        if letter == x:
            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:

k

Explanation of best case time complexity:

all k are smaller than all n, and sorted in descending order, so that each k need only be added to the front of the list

Worst case time complexity of algorithm:

nk

Explanation of worst case time complexity:

each k is larger than the last, and all k > n, so that the list must be fully explored before adding the k to the end of 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)*
IM sports	Basketball, Volleyball, Soccer	40+
Land Id Intern	Full stack Engineer	360
Provost Office	Assistant	300

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

No idea

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

No idea.

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:

No code is "owned"

Second possible impact:

Can copy any code w/ no repercussions

Third possible impact:

Could pick a subset of any size ... i.e. almost the whole repo

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 - ie. crashes.

Second type of harm:

Mental Harm - ie. decline in engagement/mental strength

Third type of harm:

Economic harm - tank other industries like drivers ed.

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 in the software engineering field. I have applied to the following w/ no current offers:

Atrium
Land Id
Epic
} software engineer

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*
Los Pollos Hermanos - IM team	40+

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)*
InterMural Sports	40+
Class Projects	100+

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 and merging, so that each teammember can work locally before touching the master.

Non-trivial feature 2:

workflow actions - after push, auto runs tests

Non-trivial feature 3:

Pull requests, make code review easy and protects the main 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)*

Best wishes wrapping up the semester and in the future!

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Name Travis Brase

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

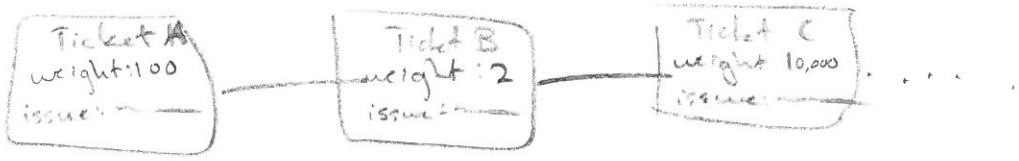
Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer 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 use a linked list, since you could use a weight parameter for each ticket object and it would be very easy to insert/remove tickets as needed.

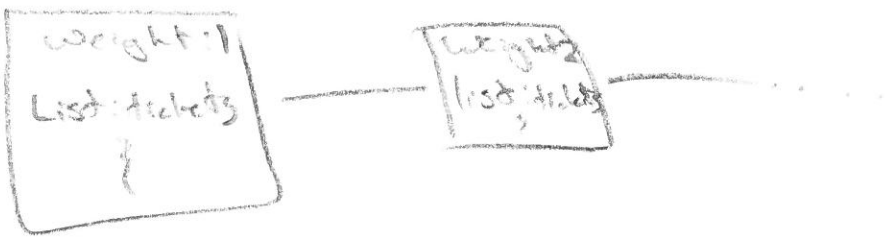
b) Describe one way in which this data structure could be implemented and draw a picture of that data structure.

Create ticket objects and then link them including any relevant data



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

Could have weight objects that then contain a second list 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): Java

Your solution:

```
int count=0;
int func(String a, char b){
    for(int i=0; i++; i<a.length){
        if(a.charAt(i) ~~==~~.equals(b)){
            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:

the inserted numbers are added ~~a~~ in the correct order, therefore ~~the numbers~~ the ~~the number~~ time it takes scales with the number of inserted values

Worst case time complexity of algorithm:

O(n·k)

Explanation of worst case time complexity:

inserted numbers are all out of order and must be reordered with every insert.

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)*
Foundant Tech	internship	15 hrs/week (2 semesters)
Zoot Enterprises	job	20+ hrs/week (1 semester)

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

When an algorithm unintentionally skews data based on some unknown bias.

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

An algorithm could fail to account for educational disparities of different races due to societal biases and skew acceptance rates one way or another.

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 plagerisation increases leading to a lack of appropriate compensation for the authors

Second possible impact:

code for major corps slowly merges into 1 massive database

Third possible impact:

sets precedent for all published code to be public domain

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 to vehicle operator due to a human-preventable impact

Second type of harm:

Bodily harm to pedestrian due to a human-preventable impact

Third type of harm:

Bodily harm to deer due to human-preventable impact

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 I am employed by Zest Enterprises on their service desk, but am applying elsewhere for better opportunities both in BZN and elsewhere in the US.

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*
D'D Group	5+ hours/week (5 ish semesters)

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)*
N/A, nothing really comes to mind from my time at MSU	
everything was generally from high-school or earlier	

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:

push/pull code from different computers

Non-trivial feature 2:

collaboration w/ multiple users

Non-trivial feature 3:

Copilot, I dont personally use it, but have heard good things

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, everything was paid for school	

Best wishes wrapping up the semester and in the future!

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Name MARK BRAIN

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

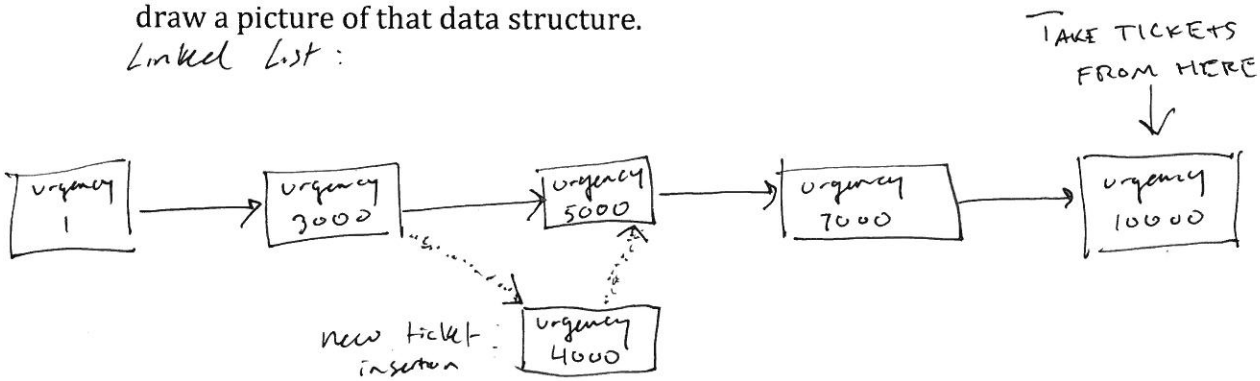
Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer 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 - allows to rank tickets by priority (urgency), but tickets of equivalent priority are otherwise processed in a FIFO manner.

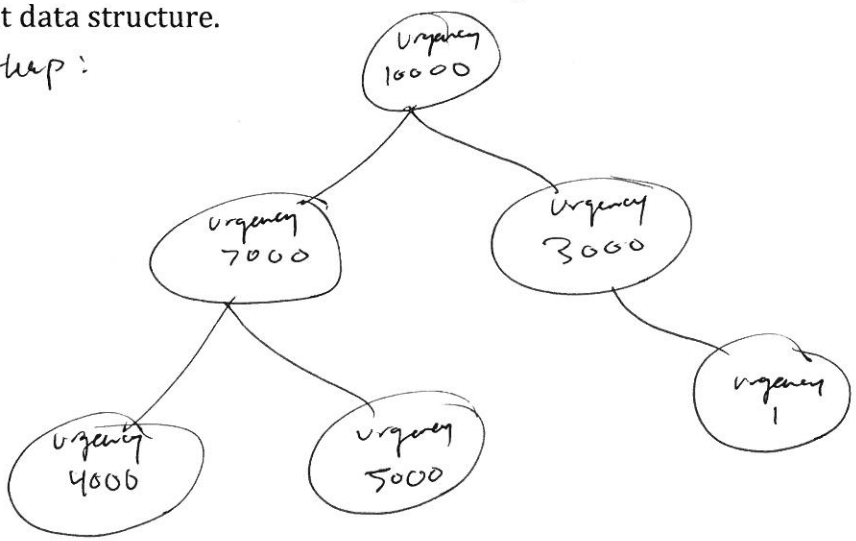
b) Describe one way in which this data structure could be implemented and draw a picture of that data structure.

Linked List:



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

Max Heap:



Question 2: Write a function in a language of your choice that has two parameters: a string and a character. The function should return the number of times that the character occurs in the string.

Your language of choice (e.g. Python): python

Your solution:

```
def count_char(full_string: str, character: str):
    char_counter = 0
    for char in full_string:
        if char == character:
            char_counter += 1

    return char_counter
```

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 each subsequent number being added to the list happens to be the lowest, no additional list traversal is required after the first comparison. Therefore, performing 1 comparison per 1 number gives k total comparisons, or $O(k)$ in the best case.

Worst case time complexity of algorithm:

$O(nk)$

Explanation of worst case time complexity:

The worst case scenario is the one in which, in the traversal of the linked list to identify where to insert a new number into the list, the new number is the highest. Therefore, it belongs at the end of the list, and so all n numbers/"links" must be checked. If this is true for each of the k new numbers, we must perform n equality checks k times, for a worst case complexity of $O(nk)$.

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 CS Dept.	Undergrad Course Assistant	50
MSU Stats Dept	Undergraduate Course Assistant	50
MSL	MSL Tutor	50

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

The tendency of algorithms to reflect human bias present in its developers or in the broader context it is used within.

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

College admissions software might be written in a way that only works w/ all English applications, which could bias decisions away from Non-American applicants.

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: Tools like a JAVA API that are used in thousands of different contexts by hundreds of millions of users are now proprietary - if you are the first person to develop this tool, you have sole domain and authority over its use.

Second possible impact: Cost of using these tools massively increases. If Oracle has a monopoly on the JAVA API, they're free to charge users/corporations as much as they want for use, since there's no alternative.

Third possible impact: Thousands of copycats attempt to make an alternate to copyright protected tools that maintain functionality but are different enough to not be copyrighted, bloating the industry.

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: Mis-identifies a pedestrian & runs them over

Second type of harm: Collects illegal movement & location data and gives it to malicious actors

Third type of harm: Incorrectly calculates a route, delaying driver

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've been accepted into and will enroll in MSU's Statistics Master's program after I graduate.

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*
Resonate Church	30
Various Intermural Sports	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)*
Sports Facilities - Student Ops Manager	1500

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: Access and tools integrated into basically every modern IDE

Non-trivial feature 2: Selection of specific collaborators & strong access/permissions management

Non-trivial feature 3: Nice pretty desktop GUI

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)*
Statistics Major (learned R)	A Ton
Independent Game Dev	50
& Set up a Plex Server	10

Technically CS but not CS classes, I guess?

Best wishes wrapping up the semester and in the future!

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Name Nicholas Call

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 would be a great little data structure for this because it would let you queue those urgency scores and then dequeue the most urgent one.

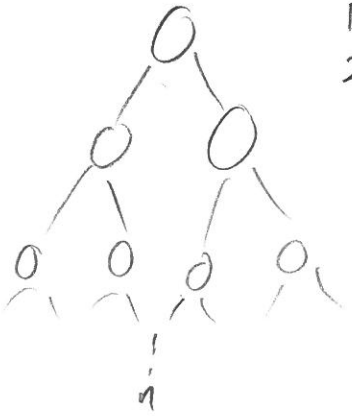
b) Describe one way in which this data structure could be implemented and draw a picture of that data structure.

A priority queue could be implemented in an array.



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 as a graph/binary tree. Each node is an object with 2 children, a priority, and any extra data for ticket.



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 count(text, ch):
    count = 0
    for c in text:
        if (c == ch):
            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(1)

Explanation of best case time complexity:

if the value of K is less than the first item in the list it can be inserted immediately

Worst case time complexity of algorithm:

O(n)

Explanation of worst case time complexity:

If K is greater than the last value you would need to step through each item in the list to get there.

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	talks/Activities for cybersecurity	60? hours?

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

Algorithms that are informed/trained themselves using biased datasets, inherting the bias in the dataset as a result.

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

This algorithm might be tuned/trained using historic admissions data. If for example that college had low diversity in admissions, think typical white American then that algorithm would actively work to ensure that college keeps the same low diversity despite that not being the desired metric used for admittance.

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:

Software Stack fragmentation. Software that could run but are held back by API it doesn't have would create many headaches.

Second possible impact:

Companies silo developers. Each software company would have their own private API so developers would have less career mobility between companies.

Third possible impact:

The free software revolution wins out with every sensible/developer friendly company explicitly opens up their API for the good of all and any company like oracle that doesn't loses all business.

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 is impossible to make a 100% safe self driving car, just possibly one safer than humans on avg. Thus, you'll have to cope with some amount of harm no matter what.

Second type of harm:

Self driving cars aren't a solution to traffic, they aren't much better than "one more lane". Pursuing safer cities with good public transit, pedestrian/bike infrastructure would be much safer than putting more cars on the road in the pursuit of some tech utopia.

Third type of harm:

It might put long haul drivers out of jobs requiring that they switch careers and other turmoil.

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 would love to get a masters if possible and I intend to apply there and a few other places. If that falls through then I'll start working somewhere, not sure where.

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*

Introvert :)

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)*

Intranet :)

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

Name of most sophisticated version control system:

Git

Non-trivial feature 1:

Git uses an object store of all files to efficiently hold 1 copy of a file if unchanged through multiple versions saving on space.

Non-trivial feature 2:

By default you must manually enable git repos in mounted drives. Apparently this was to prevent university students from running arbitrary code when a prof cd.into that directory with a git aware prompt.

Non-trivial feature 3:

Git has a system for storing large files but not pulling them down unless explicitly asked. This extends gits capabilities to store large files without bumping clients and is how Hugging face projects distribute ML models.

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)*
Hackercats	60 hours?

Best wishes wrapping up the semester and in the future!

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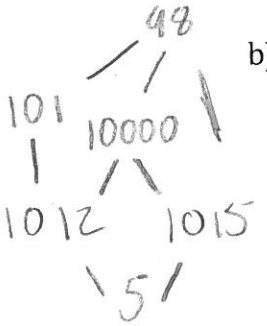
Name Luke Cormier

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 node tree data structure

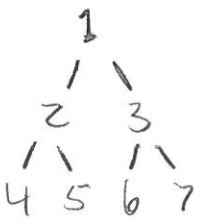


b) Describe one way in which this data structure could be implemented and draw a picture of that data structure.

Using node sorting algorithm, we could determine which node which would be the ticket's value is higher or lower and return it to the company.

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

Using a sorted tree with most important ticket first in descending order.



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:

```
func returner (A) {
    Str A1 = "Apple";
    A = A1;
    return A1;
}
```

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:

The best case runtime requires that it proves that $k << n$ with n floating points numbers. Thus if we prove that $k << n$ once then that that is our best runtime. (n)

Worst case time complexity of algorithm:

$O(n \log n)$

Explanation of worst case time complexity:

With this we must prove that $n > 0$ making it a real number with $k > 1$ then proving that $k << n$ after n runtimes.

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)*
Smarty Cats	TA	30

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

Not meeting a particular condition based on a pre-determined algorithmic condition.

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

Selecting from a group of high school graduates who lived in Montana only.

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:

This would allow for copyrighted code being allowed for use to the public.

Second possible impact:

Could allow for more advanced improvements to pre-existing code without having to start from scratch.

Third possible impact:

People will copy code from many other users without proper credit.

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:

Malfunction in software could cause an accident resulting in possible vehicular collisions.

Second type of harm:

People who drive for a living will lose their jobs.

Third type of harm:

Cars could be cyber attacked and be used to cause damage by hackers.

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 several places:

Boeing: Data analyst entry

LLC: Software engineer internship / Worksivia: Data analyst entry

I have recieved no returns on my applications.

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*
Lamplter LC	~30

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)*
Bowling	30
Wrestling	30

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:

Javascript

Non-trivial feature 1:

Form of coding language

Non-trivial feature 2:

Automatic bug search

Non-trivial feature 3:

Automatic recommended coding solutions

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)*
Multi-media	100

Best wishes wrapping up the semester and in the future!

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Name Aurora Duslin

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.
Linked List in DESC order. Most prioritized will always be at the front and can be shuffled down for a higher priority person. Remove from list when completed.

b) Describe one way in which this data structure could be implemented and draw a picture of that data structure.
Every item is a 'ticket' and every ticket has a Name and Urgency Score. Tickets ordered by 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):

Python
sentence str
letter cha

Your solution:

```
def occurences(sentence, letter):
    counter = 0
    for char in sentence:
        if char == letter:
            counter += 1
        else:
            pass
    return(counter)
```

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(0) no time

Explanation of best case time complexity:

k=0, no new things are added and it is done instantly.

Worst case time complexity of algorithm:

O(k^)

Explanation of worst case time complexity:

k=n-1, assuming every new k is larger than the last, the sort will have to traverse the entire length of the list before adding the new item.

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)*
SOTW Marching Band	Rehearsals, Game days, Sectionals, Leadership meetings	168 hours
NSF REU	Undergraduate Research	400 hours

4 16 9 112 hours
3 + 40 155
8 + 5 168

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias 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

First possible impact:

Avoids Java API Monopoly possibility

Second possible impact:

Confirms that code is reusable, repeatable, and that new ideas can build from old software

Third possible impact:

Open Source will continue to be open source with no pay wall

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 injury to passengers or pedestrians while driving

Second type of harm:

Taxi Cab Industry Crash for persons driving the taxis.

Third type of harm:

Must make moral decisions in case of emergency. There's no right answers in a moral case.

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:
- Software Engineer – SunWest *
- Software Engineer - Oracle
- Back-End Developer - too many to keep track
- Full-stack Developer

* waiting on technical review

Possible Grad School:
- Here at MSU if covered by Industry

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*
SOTW Marching Band	168 required + 100 social

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)*
NSF REU - Undergrad Research	400

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 means must have?

Non-trivial feature 1:

A way to push new changes into the repo.

Non-trivial feature 2:

A way to pull new changes into the repo.

Non-trivial feature 3:

An extensive history log with the ability to revert to an older 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)*
NA	

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Name Amanda Faulconer

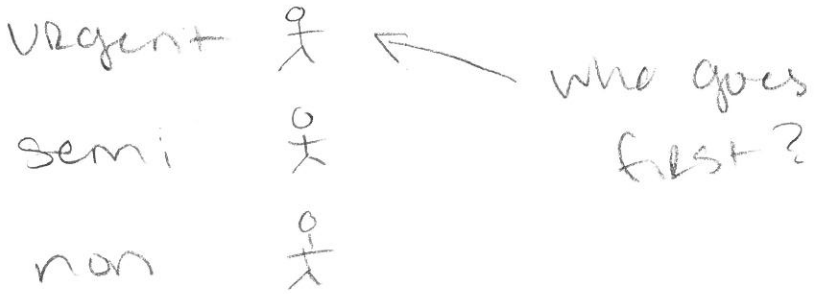
Major (Circle One): Computer Science B.A. or Computer Science B.S.

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.

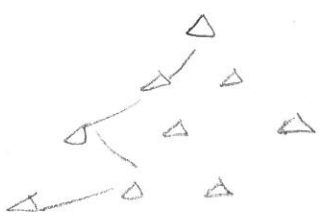
one that takes a ticket by urgency first based on a number

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.

some sort of tree 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 function(char a, int b)
  if i(------>
  S String ...
    C char ...

  Return i++
```

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:

finding the best case for an algo

Worst case time complexity of algorithm:

O(n*k)

Explanation of worst case time complexity:

multiplying that case by itself or another variable

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	meetings	40
Cyber Lab	coder	18 × 30 hours
C2 tracks	programmer	18hr × 16 weeks
Northern Montana		40hr × 16 weeks
Glacier National		16hr × 3 months
Park Conservancy		

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

It's the standard by which algorithms must hold them self to. like a Protocol or set of Rules

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

An algo that does not bias against background, Race, gender, age . . .

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:

We share code online anyways, that many lines of code should not matter.

Second possible impact:

It can allow for future teachings of students on the code

Third possible impact:

Sharing is caring.

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 be able to identify curtain objects in the roadway causing harm to the driver or pedestrian.

Second type of harm:

Not understand another vehicle is in front of them & not stop

Third type of harm:

When certain colors appear the computer can get confused & not know what to do, like in construction sites.

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 Recieved a few offers from Nothrop Grumman as a Software Systems engineer, Boeing as the same but all are Relocation so I have turned them down Currently I am going to move home & take time with my husband while I look for something close to home or remote

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*
N/A	N/A

Question 10: List any activities that you were involved with during your time at MSU that prepared you to work more effectively with teammates whose backgrounds are significantly different than your own. For each activity, (1) **describe** the activity and (2) **estimate** the total number of hours you spent.

Activity Description	*Hours Spent (estimate)*
WORK outside of SCHOOL	ALOT

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:

push

Non-trivial feature 2:

pull

Non-trivial feature 3:

merge

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)*
Grace hopper conference	3 days
Various workshops	10 hrs
Networking events	10 hrs

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 Joshua Fried

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

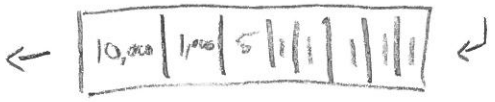
Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer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

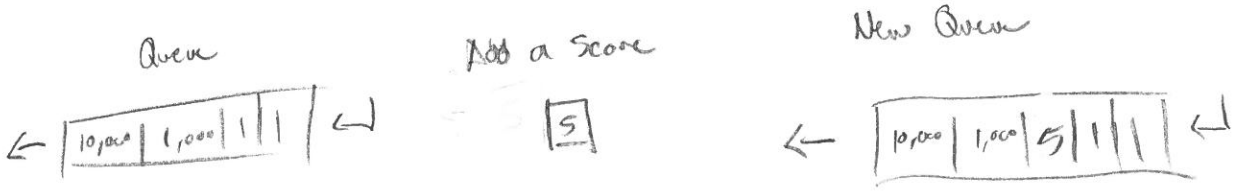
b) Describe one way in which this data structure could be implemented and draw a picture of that data structure.

This could be implemented using a Queue class from java.util library.



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

Everytime there is a new score added, expand the queue by 1 and reorder the 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): Java

Your solution:

```
Private int function (String s, char c){
  int occur = 0
    for ( int i =0; i < s.length; i++) {
      if ( s.charAt(i).equals(c)) {
          occur++;
      }
    }
    return occur;
}
```

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:

I would have to go through the whole linkedList (n) to find where to place the additional K floating points.

Worst case time complexity of algorithm: $O(n \cdot K)$

Explanation of worst case time complexity:

Go through the whole linked List one time for every K.

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	NA	NA

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

An algorithm bias is an algorithm that one picks the same type of one thing.

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

It could just pick one broad thing like GPA over 3.5 and not account for extracurriculars or SAT scores.

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:

Companies would start to copy others more frequently.

Second possible impact:

Make people believe that its good to take other work.

Third possible impact:

Companies would put back doors in there code to stop other Companies from taking 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:

harm the passengers if it crashes

Second type of harm:

harm other cars if it crashes

Third type of harm:

harm pedestrians if the car hits them or something close to them.

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, I have applied to over 50 companies and not heard back from any. I plan to apply to many more before 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*
Intermediate Volleyball	15 hours
Intermediate Football	15 hours
Intermediate Soccer	15 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)*
Intermediate Sports	45 hours
Retail Work	500+ 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:

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)*
Tought myself Javascript	50 hours
Code Interview Practice	120 hours

Best wishes wrapping up the semester and in the future!

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Name Mitchell Froelich

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

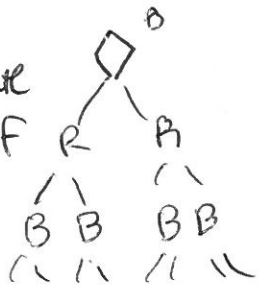
Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer 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 tree structure as it is the most efficient way of dealing w/ a heirarchy of many values.

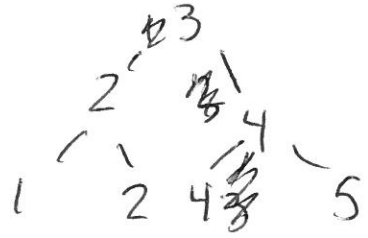
b) Describe one way in which this data structure could be implemented and draw a picture of that data structure.

Red & Black tree where each value is assigned a color at creation of the tree or as added.



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

Binary Search Tree (BST) is also a good way of dealing w/ this problem as anything to the right is greater and anything left is less than.



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:

```
function chars_in_string(string s, char c) {
int count = 0;
for (int i = 0; i ≤ s.length, i++) {
    if (charAt(i) in s == c) {
        count += 1; }
    else { continue }
}

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:

$O\left(\frac{N}{2}\right)$

Explanation of best case time complexity:

the point is in the front half of the LL.

Worst case time complexity of algorithm:

$O(N)$

Explanation of worst case time complexity:

The value K is near, or is, greater, than the biggest value in 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)*
Big Sky Sun Esports	Rocket League.	> 300 (350?)

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

The idea that some algorithims are naturally biased due their construction and what they don't account for.

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

Placing people of a color above others to meet a quota or ~~dog~~ simply because that is what it is programmed to do.

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 free use becomes less restrictive, and allows for the use of other's code ~~to~~ more ~~expedi~~ freely.

Second possible impact: Expediated coding times due being able to use code already created and not starting from scratch.

Third possible impact: Coders are not needed as much since code can be pulled from elsewhere.

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: Crashes due to miscalculations.

Second type of harm: Taking the lesser of two evils and killing one to save many

Third type of harm: Placing "drivers" life over others and choosing to kill a pedestrian.

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 for a system administrator job within the National Park Service, Yellowstone. I have received a couple offers through private sector as well.

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)*
Rocket League Team BSSE	350.

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:

Windows

Non-trivial feature 1: updates upon request

Non-trivial feature 2: forces updates for security

Non-trivial feature 3: will take you in web browsers to area to update software.

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)*
Attended meetings to discuss coding problems. w/ other CS majors.	30.

Best wishes wrapping up the semester and in the future!

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Name Benjamin Haedt

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

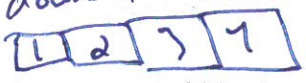
Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer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

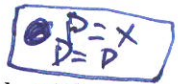
a) What simple data structure would best model this situation? Explain.

priority Queue, there is one I made for OS class that Bumps to the top if it has a higher priority than the one in the q. ~~[illegible].~~ But this should work

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

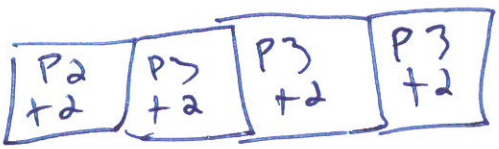
An array of objects where the objects hold a number and the data ~~[illegible]~~ that loads in ~~[illegible]~~ a new ~~object into the array and after a clock cycle~~ every clock cycle or predetermined set of time to refresh the Queue. check the highest loaded object in the array and if it's higher you can either bump it down to wait or set it to process next





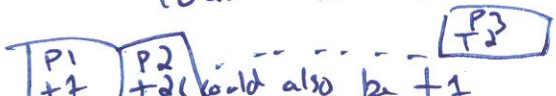
c) Describe a second way in which this data structure could be implemented and draw a picture of that data structure.

the second way is similar but instead of waiting for the processing object to finish, stop it, load in the object to be ran, and then run that until either another higher priority object comes in or it completes



current Priority ②

load in new object where p=1



could also be +1 depending on if a clock cycle has ran

object t=time priority=p data=D

(Python to easy)

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):

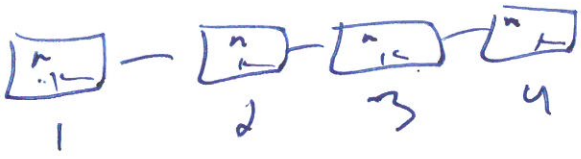
Your solution:

```
fun countString(String):
    for i in String:
        count+=1
    return count

fun countChar(char):
    for i in Char:
        count+=1
    return count
```

In Java

```
public string countChar(string){
~~for(x=0; x<len(string); i++)~~
~~while String has more char~~
    ~~count++~~
~~while string[x]~~
for(x=0; x<len(String); i++){
    count = 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**.

I forget. does << shift left or right? I'll say left

Best case time complexity of algorithm: If shifting left the fp gets bigger depending on where we add to the list and what is the beginning and end.

should just be O(linear)

Explanation of best case time complexity:

Since we are adding a number to the linked list. It will go in sequential order and be linear time

Worst case time complexity of algorithm:

O(linear)

Explanation of worst case time complexity:

If n is always the same, which it should be. Then adding a k whose ~~bit is the~~ made from the shifted bit of n, and since this is a singly linked list where we will always add from the same position. Then it should have the same 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)*
Bounty of the Bridgers	help the people	100
Adventurers Guild? (I	forgot name Play DnD	100
	It's been a few years)	

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

a way to solve solutions that require some sort of machine to function

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

could cut down on bias based on relgion, race, etc...

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: Need more info to make determination. I guess I'll pick Oracle but the little info I have

First possible impact: Holds companies (specifically in this case software dev comp) accountable to not copy work.

Second possible impact:

At what point does it become copying? ~~[illegible]~~ reference the replacement ship example.

Third possible impact:

there are only so many ways code can be written also. After billions of lines of code there is a possibility of overlap

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: Drunk driver behind wheel

Second type of harm:

Is the system programmed well enough to differentiate objects?

Third type of harm:

Who is at fault?

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.

Take the winter to go back to helping people and teach children how to ski as a CS PSIA ski instructor help my dying father, hopefully build one last ~~home~~ house w/ ~~him~~ him. ~~Apply~~ work on security certs from CompTIA and ISC^2. Apply to Los Alamos National lab and ~~other~~ Other gov jobs. make sure to enjoy the last time I have w/ my father

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)*
Robot class w/ hunter	30
We learned how to work on making the time we needed and communicating	

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:

What is a control sys?

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)*
Software debugging	100
and game hacking	

Best wishes wrapping up the semester and in the future!

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Name Brendan Harrington

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

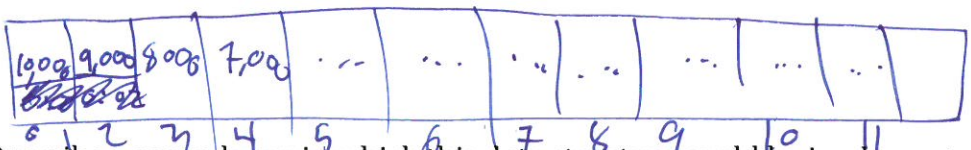
Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer 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 FIFO ~~Array~~ stack of customers that hold time recived an urgency. This would allow you to sort by urgency

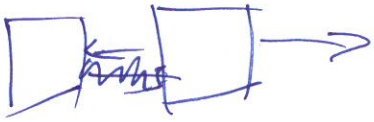
b) Describe one way in which this data structure could be implemented and draw a picture of that data structure.

This could be done using an array of ints where the urgency would determine order (if that is the only criteria of interest)



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

Could be implemented using a singly linked list inserting at the end and then checking every next node to see if they are more urgent



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 char_counter ( ex_string, ex_char ):
    count = 0
    for letter in ex_string:
        if letter = ex_char :
            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:

~~if the number being inserted is already the largest number therefore there would only~~

1K = k

Explanation of best case time complexity:

you could have an algorithm that adds the number then checks every item it is linked to in order to see if that number is smaller than the number being inserted. If it is then insert the number. If every number in K is already sorted in assending order (best case) and is larger than the numbers in n then the time complexity for inserting the number would be constant

Worst case time complexity of algorithm:

Kn O(n)

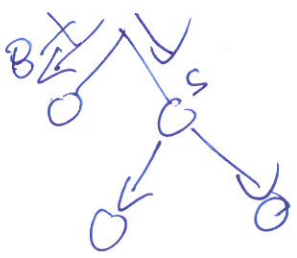
Explanation of worst case time complexity:

The worst case would be traversing the entire linked list k times to insert every value

K*n

Tree would be more efficient as it could be

logn



6x32x3/4
1
18
32
36
540

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)*
Outdoor Club	hiking	80 hrs
Men's Volleyball Club	Volleyball	500 hrs
Assistant Coach/practice players	Volleyball	100 hrs
Robocats	Robotics	100 hrs
~~Computer Vision Research Assistant~~	Computer Vision	150 hrs
Research Assistant	Robotics	240 hrs

research assistant

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

Putting bias into algorithms (racial, gender, etc)

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

not recomending applicants based on race, gender, etc.

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 is more open to be shared

Second possible impact: The copyright of code could be harder to prove

Third possible impact: Companies could keep existing code instead of having to potentially rewrite code that was deemed to be Oracles copyright

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: property damage of a car driving itself into other objects/property

Second type of harm: Monetary harm: could have predatory features engrained in the software (monetization forms introduced)

Third type of harm: Physical harm: If an error caused the car to hit a pedestrian

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 in Bozeman for Atrinm, I have also applied to NAVSEA and Fedst in case Atrinm decides to not offer a job. If ~~that were~~ all of those fail then I have an offer from Raythen and would move to Tuscan

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*
Intramurals	100 hrs
Pickup Volleyball	250 hrs
Group Basketball	80 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)*
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: Git

Non-trivial feature 1: branching - seperates features into distinct sets to keep work clean

Non-trivial feature 2: Merging - merges branches allowing for the intergration of new features when finished developing them.

Non-trivial feature 3: cloning - Allows you to quickly retrieve code from remote repositories to work on your local machine

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)*
Web Design (CSS & HTML)	250 hrs
Web Development (React)	80 hrs

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 Felicia Jayasaputra

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.

Sort the urgency scrores from the highest to the lowest and remove from the top when it has been addressed.

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

1) Sort highest urgency score from highest to lowest

2) address it from the top

3) remove, once it has been address it directly

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

1) do a while loop to find the highest urgency score

2) address that urgency score

3) remove it once it has been address

4) Run the while loop again to find 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:

```
Public numTimes (String s, char c) {

    S = Hello;
    C = H;
    for (i = 0; i ≤ S.length; i++) {

        if (i == C) {

            numChar ++

        }

    }

    return numchar;

}
```

Question 3: Consider a singly linked list that contains **n** floating point numbers and is maintained in ascending order. An additional **k** floating point numbers will be added to the list, one at a time. You may assume that **k << n**.

Best case time complexity of algorithm: O(1)

Explanation of best case time complexity:

Since you are just inserting an additional numbers into the Singly linked list, it's best case time complexity would be O(1). This will only be valid if the number that is being insert into the Singly linked list is the largest because we can just put it at the back

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

Explanation of worst case time complexity:

This will only be valid if the number that is being insert into the Singly linked list is the smallest because we should go through all singly linked list and insert the node at the right spot. This is the smallest so we need to go through all the nodes and put it at the very first.

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 Women's Tennis	Tennis	20 hours / week

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

Algorithmic bias is when the algorithm is not exactly true or there has been a mistake about the algorithm due to wrong research.

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

The hypothetical example would be causing bias in college data and this could lead to error and bias data in college admission 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: Since the rule is unacceptable and that they can get fine based on the rules.

Second possible impact: More careful on writting code and getting other resources.

Third possible impact: Carefully read the rule before doing something.

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 cause danger for the passenger if the software has bugs

Second type of harm: The software doesn't detect the surrounding carefully and accidents happens.

Third type of harm: Machine error which maybe due to software error.

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 planning to go to Grad school here at Montana State University studying Computer Science and this is the only Grad school I applied. I got an offer as a full time at FAST enterprises but I'm planning to go to Grad school first.

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*
MSU Women's Tennis	More than 20 hours each week

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)*
MSU Women's Tennis Team	20 hours / week
Class group work	5 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: Google

Non-trivial feature 1: It can give ^ (answer to) anything we want

Non-trivial feature 2: Little box for us to type any search we want

Non-trivial feature 3: All articles / research that is^ (most likely) reliable is there.

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)*
E - commerce	5 hours / week
Business Research	2 hours / week

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 MAX KUTTNER

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

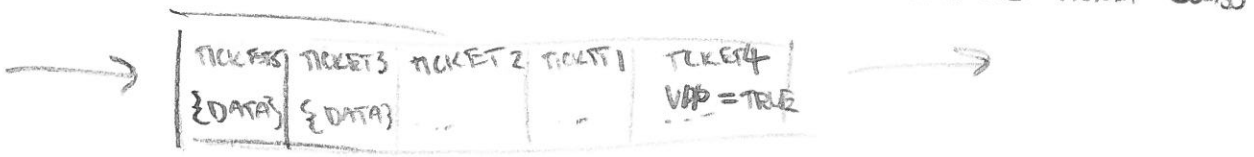
Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer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

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

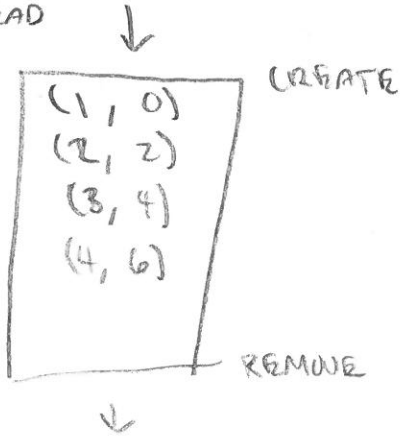
"FIRST IN FIRST OUT" EXCEPT THE ORDER WILL ALSO FACTOR IN IF YOU ARE A VIP OR NOT



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

DONT USE A CLASS, BUT USE TUPLES INSTEAD

LIKE (NUMBER_TICKET, 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): Rust

Your solution:

```
pub fn count_chars(str: String, target: char) -> i32 {
    let mut count: i32 = 0;
    for (index, ch) in str.chars().iter().enumerate {
        if (ch = target) {
            count += 1;
        }
    }
    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:

INSERT INTO FRONT OF LIST EACH TIME, NO TRAVERSING NECESSARY, JUST REASSIGN THE HEAD NODE.

Worst case time complexity of algorithm:

O(n·K)

Explanation of worst case time complexity:

VALUES OF K ARE LARGER THAN ALL VALUES IN THE SLL, MUST TRAVERSE THE ENTIRE LIST TO INSERT TAKING 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)*
COUSE ASSISTANT	TUTOR/MENTOR	~35

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

PREFERENCE FOR OR AGAINST CERTAIN GROUPS, BE IT RACE, AGE, GENDER AS THE RESULT OF AN ALGORITHM.

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

IT MIGHT SET ADMISSION STANDARDS HIGHER OR LOWER FOR CERTAIN GROUPS OF PEOPLE

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:

EVERYONE CAN USE THIS CODE (JAVA)

Second possible impact:

ORACLE WONT EARN MONEY OFF THE API

Third possible impact:

PRECEDENT FOR FUTURE CASES.

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:

HIT A PEDESTRIAN

Second type of harm:

NOT RECOGNIZE PEOPLE OF COLOR (COMPUTER VISION)

Third type of harm:

CAUSING AN ACCIDENT

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.

- MOVE BACK IN WITH PARENTS
- LOOK FOR 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*
N/A	0
I WAS NOT SOCIAL	

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)*
CLASS PROJECTS	~ 50

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: MERGE: RESOLVE LOCAL CHANGES WITH MASTER REPO

Non-trivial feature 2: STASH / POP

SAVE LOCAL CHANGES

POP THEM

Non-trivial feature 3: PULL REQUEST (PR)

REQUEST A PULL FOR CHANGES YOU'VE MADE TO CODEBASE

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	~ 100
COURSERA	~ 20
TEXTBOOKS	~ 20

Best wishes wrapping up the semester and in the future!

THANKS :)

Montana State CS Graduating Senior Exam

Academic Year 2023-2024, 80 minutes.

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Name Sam Kynett

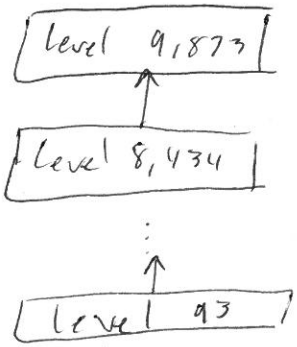
Major (Circle One): Computer Science B.A. or Computer Science B.S.

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.

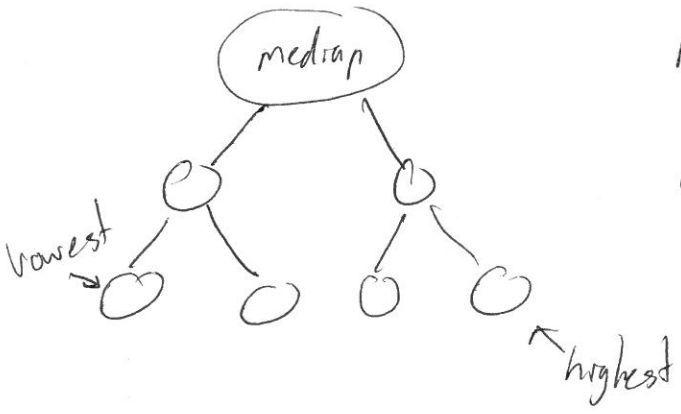
A singly linked list made to be in ascending order would work here I suppose

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



Each ticket is its own object with a level value and a pointer to the next highest ticket

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



A binary tree with the most median value as the root, and the lowest and highest values as the shown leaves

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 foo(String s, char c){
    int count=0
    for(int i=0; i < s.length(); i++){
        if(s.atChar(i).equals(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: ~~kn~~ nk

Explanation of best case time complexity:

If its a singly linked list, it will have to check each cell in the list in order one at a time. So at its longest it will need to complete a number of steps equal to the length of the list multiplied by the number of insertions.

Worst case time complexity of algorithm: nk

Explanation of worst case time complexity:

I think its the same as what I did above? It's been a few years since I wrote with complexity like this

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)*
QSA	drag volunteering	15 hours
AWC	attend meetings	3 hours

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

when an algorithm will take on human bias in its results like with predictive policing

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

College admission software could easily end up accepting more white guys than any other demographic (even considering population data)

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:

harder to copywrite code

Second possible impact:

Oracle ~~tightens~~ keeps their stuff on lock more

Third possible impact:

Google starts stealing more 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:

hitting unrecognized pedestrians

Second type of harm:

harming the driver by swerving away from pedestrian and into wall

Third type of harm:

~~cause traffic accid~~

car to car collisions

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 currently interning at Foundand and ~~for~~ the plan is to get on 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*

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:

Not entirely sure what counts as a version control system here.
I'm bad ~~what~~ when it comes to jargon and could use an example

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.

I don't believe there were any

Activity Description	*Hours Spent (estimate)*

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 Bryce Leighton

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.

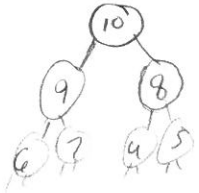
a) What simple data structure would best model this situation? Explain.

A priority queue because it would be the most efficient data structure in finding the most urgent ticket and removing it.

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

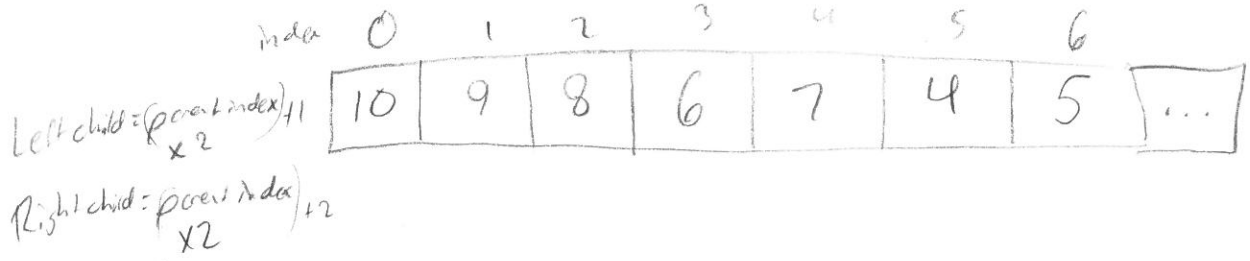
A tree structure that always has the highest score on top as the root. A heap is a tree structure essentially.

Probably didn't order the lower children correctly but was trying to just do a visualization



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

A heap in the form of an array. Same logic as before where you "model" a tree in an array as heap the min/max as the root (index 0)



Question 2: Write a function in a language of your choice that has two parameters: a string and a character. The function should return the number of times that the character occurs in the string.

Your language of choice (e.g. Python):

Your solution:

Python

```
def occurrences(word, char):
    times = 0      # number of occurrences of char in word
    for ch in word:
        if ch == char:
            times += 1

    return 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:

O(1)

Explanation of best case time complexity:

You add 1 number and it is the smallest value, so it immediately gets added to the front as the head.

Worst case time complexity of algorithm:

O(n)

Explanation of worst case time complexity:

No matter what k is, you may have to iterate through all nodes in the list to find the insertion nodes' correct positions. This depends on how many values you are adding so it would be O(k·n) which boils down to O(n) because k is a constant less than 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)*
Football	player	5-25 hrs/week, a ton
MSU REU Program	Research in Summer	400
MSU Undergraduate Research Assistant	Research in Chem's lab	80
MSU Undergraduate Course Assistant	107 UCA	150
Techlink	Intern	250
Aurora	Intern	480

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

Bias in an algorithm that favors certain results over others.

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

Could be a bias against/for those of a certain ethnicity, orientation, gender, etc.

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:
We can use language APIs freely in our projects.

Second possible impact:
Open source projects with common languages.

Third possible impact:
Democratized tech world, developers have more freedom.

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 to people in the event of a crash due to a bug.

Second type of harm:
Racial bias in how its "vision" was trained. i.e. biased ML model

Third type of harm:
How it decides things in an emergency situation. i.e. trolley problem

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 hope to work at Aurora in town as a software engineer. I'll hear back from them soon if I got a return offer (I interned there). Applied to many other companies with no luck yet.

Might consider grad school for something involving embedded systems somewhere, if jobs don't work out.

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*
Football	A ton

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)*
Football	A ton

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:
Rebasing

Non-trivial feature 3:
The stages (adding, committing, pushing)

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)*

Nothing really

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 Basden McElroy

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

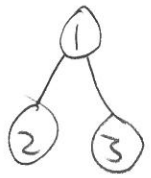
Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer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

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

Tree. The root is the lowest number.



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

Array. The left side is the lowest number



Question 2: Write a function in a language of your choice that has two parameters: a string and a character. The function should return the number of times that the character occurs in the string.

Your language of choice (e.g. Python):

Your solution:

Python

```
def count (string, character):
    int counter = 0
    for i in string:
    if i == character
        counter += 1

return counter
```

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:

$\log(n) \cdot k$

Explanation of best case time complexity:

if you use a tree search, you could get a $\log(n)$ insertion time

Worst case time complexity of algorithm:

$O(n \cdot k)$

Explanation of worst case time complexity:

if each number is the largest, and you search numerically then you would search n numbers k times $= n \cdot k$

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)*
ACM	interview / job prep	20

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

When an algorithm introduces bias to data

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

Canidates could be chosen over others based on the algorithm used to select

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:

Open source licencing is protected

Second possible impact:

Small companies making API access could have trouble protecting their IP.

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, the car can hit things.

Second type of harm:

Privacy: Cars would know your location and have video of everywhere you go

Third type of harm:

Freedom: Cars could limit speed or control in cases of emergency

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

Potential offer at Caci for software engineering

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*
Pickleball	200 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)*
Pickleball tournaments	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:

decentralized control

Non-trivial feature 2:

rebasing

Non-trivial feature 3:

merging

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)*
C++ Podcast	20
App development	10

Best wishes wrapping up the semester and in the future!

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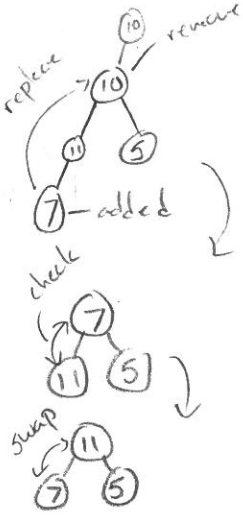
Name Samuel Morabee

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. keeps the largest urgency score at the top of the list to remove.

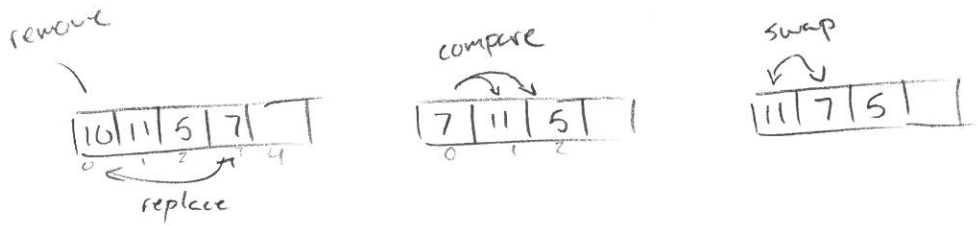


b) Describe one way in which this data structure could be implemented and draw a picture of that data structure.

A tree data structure, removing the largest number, replacing it with the last added ticket urgency number and checking the children of that top node and swapping them if the childs urgency number is larger. Until its at the end of the tree.

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

As an array 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:

```
function Occurs (string sentence, char character){
    chars = [sentence.length()]
    count = 0;
// convert string to list of chars
for(int j =0; j< sentence.length(); j++){
    chars[j] = sentence.charAt(j);
}
for (int i=0 ; i < chars.length(); i++){
        if character == chars[i]{
            count = count +1 ;

    }

}
System.out.println("Total occurances of " + character + "In " +
sentence + " was " + 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:

we can assume that each k value is less than n but not less than the previous k value. We have to iterate through the k values in the list, compare and add that node value into the list. for all k values, no need to check n floating point numbers.

Worst case time complexity of algorithm:

$O(n^2)$

Explanation of worst case time complexity:

Iterate to find the number just above the k and below the k. Then replace pointers in list to new floating k node.

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 structure of an algorithm has an inherit answer to a problem that can have multiple answers but chooses on a precondition inutle code.

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

If admission requirements are not weighted properly a student with a higher gpa with little extra curriculars is accepet compared to a student with slightly lower gpa but higher extra curricular hours.

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 is considered open source

Second possible impact: Companies copy codes from API's legally

Third possible impact: Oracle & companies bankrupt.

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 to the driver/passengers of the current vehicle and others.

Second type of harm: property damage, hitting another car, etc.

Third type of harm: financial harm, possible law cases to company, stock plummets.

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, haven't yet. But I am also considering of taking a break and consider graduate school here in the fall.

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)*
Weekend student supervisor at SUB	20hrs every weekend, since freshman year.

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:

Not sure.

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!

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Name Cole Reimer

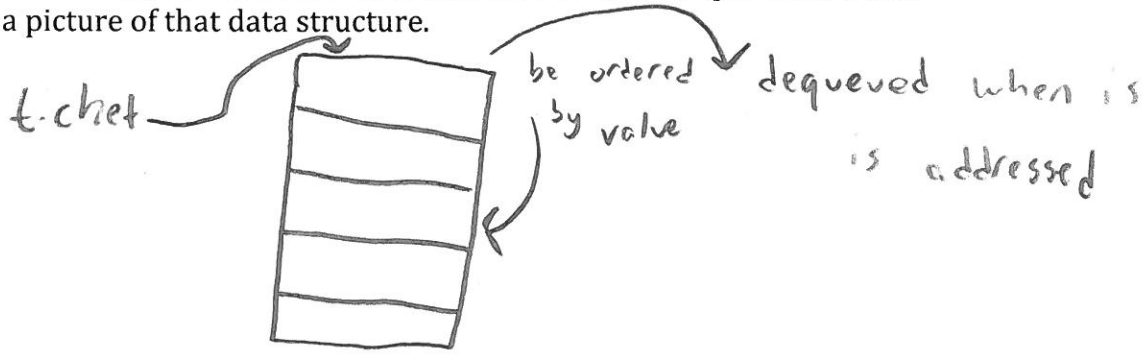
Major (Circle One): Computer Science B.A. or Computer Science B.S.

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.

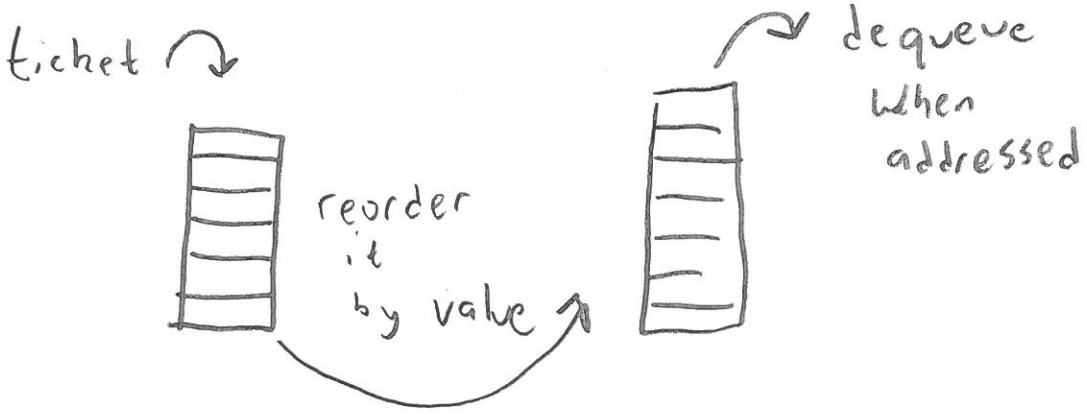
a) What simple data structure would best model this situation? Explain.

Priority queue, assigns a value and prioritizes the queue based on that 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.



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 myFunc(sentence, char):
    count = 0
    for i in range(len(sentence)):
        if sentence[i] == char:
            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:

$O(kn)$

Explanation of best case time complexity:

Each number added takes n amount of time, so k numbers times n makes the most sense.

Worst case time complexity of algorithm:

$O(k)$

Explanation of worst case time complexity:

If each number added is smaller than the smalles number, each number will be placed at the head of the list, taking O(k) amount of time

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)*
Men's club soccer	Player	100
Soccer Coach	Coach	100

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

Haven't heard of algorithmic bias.

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

College admissions could consistently take students with the highest GPA's instead of looking at GPA's paired with other factors such as extracurriculars or backgrounds?

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 can build off of other software making software better all around.

Second possible impact:

Companies could start to steal software and claim it as their own.

Third possible impact:

Software companies can partner and work with each other to create desired software outcomes.

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 to the driver.

Second type of harm:

Physical harm to other people not in the car.

Third type of harm:

Reputational damage to the company.

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 looking to either get a fulltime job or an internship that leads to a fulltime job. I haven't received any offers but I've applied to Workiva, on X, Cognizant, and 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*
Men's club soccer	100

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)*
Men's club soccer	100
General work outside of school, jobs etc	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: Not sure what a V.C.S is but Java/Intell.j

Non-trivial feature 1: variable definitions: makes it clear the type of variable

Non-trivial feature 2: running a program: easy and non-trivial

Non-trivial feature 3: debugging a program: also super easy in intell.j

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)*
Redis database system	15 hours

Best wishes wrapping up the semester and in the future!

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Name Jaden Schultz

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 would work well to model this situation because certain items in a priority queue take precedent over others

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

This data structure could be implemented by sorting every ticket by urgency score, and then creating a priority queue where the most urgent ticket is dealt with first.

Customer	Score
A	10000
B	9872
C	9121

Priority ↑ Deal with top results first

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

We could also implement this data structure by sorting every ticket by the status of the customer (VIP or regular customer)

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:

```
int charCount = 0
String word = "cheeseburger";
String character = "e";

public static stringSearch(String word) {
    Array wordArray = new Array();
    for(i in word, i++){
        Array.add(i);
    }
    for(i in word, i++ {
      if (i == character)
        charCount++;
    }
    return charCount;
}

main(){
  stringSearch(word);
  System.println("The word " + word + " has " + charCount + character + "s in it.");
}
```

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:

$O(n)$ is the best case time complexity for this algorithm because each additional floating point number is processed in the same amount of time. Assuming no additional floating point numbers are added, the algorithm should finish running in $O(n)$ time.

Worst case time complexity of algorithm:

$O(n)+k$

Explanation of worst case time complexity:

Going through a singly linked list should only take $O(n)$ time, but each number added to the list will increase the amount of time it takes for the list to finish processing.

Question 4: List any extracurricular community involvement (e.g. the Gallatin Valley Food Bank or coaching), extracurricular university involvement (e.g. Engineering Ambassadors, Swing Cats, AWC or ACM) or paid internships (e.g. Workiva intern or Undergraduate Course Assistant) that you were involved with during your time at MSU. For each activity, (1) **provide** the name of the organization, (2) **describe** briefly your main activities and (3) **estimate** the total number of hours you spent.

Organization	*Main Activities*	*Hours Spent (estimate)*
Swing Cats	vintage swing dancing	50
Tabletop Brigade	Board/card games with friends	120
RPG Adventuring Club	One shot D&D nights, mini painting, etc.	50

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

Algorithmic bias is the tendency for a program to unfairly favor one outcome over another.

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

Algorithmic bias could cause a piece of college admissions software to favor someone of one race while casting out an applicant of another race, even if they are just as qualified as the former student.

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:

Google would likely have to rewrite their whole mobile operating system, or at least just the parts of it that used the copied code.

Second possible impact:

Google might have to delay software updates for their mobile OS

Third possible impact:

Google might have to delay the release of new hardware that uses the infringing 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:

The OS of a self driving car might cause loss of life by any means necessary if it means the passengers have a better chance of surviving.

Second type of harm:

The OS of a self driving car might cause the loss of the lives of the passengers by minimizing the harm done to other people at all costs.

Third type of harm:

The OS of a self-driving car might automatically charge you if any damage is done to the vehicle, and this might not be money that the vehicle owner has.

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.

More than anything, I'd like to get on my feet. I haven't started job hunting yet because I'm afraid of the professional world and I feel that I'm inexperienced and grossly underqualified. I don't even have my full driver's licence yet, and I'd like to figure that out so I'll have more freedom to do what my heart desires. In a year, I'd like to be independent from my parents and gaining workplace experience somewhere that will be beneficial to my future. I've thought about graduate school since a part of me wants to keep going to school, but I'd like to sort out my finances before sinking more money into my education.

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*
Swing Cats	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)*

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:

The ability to create branches, which allow users to commit and push changes to their repository.

Non-trivial feature 2:

Repositories (or repos) which allow users to store their projects on Github. They can link to a corresponding folder on your computer, and any changes there can be pushed to the repo through an IDE such as Visual Studio Code or IntelliJ.

Non-trivial feature 3:

Pulling changes from a repository, or cloning from a repository so a user can be up to date with their 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)*
Learning C# via Unity to make games	200

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 Audrey Senecal

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

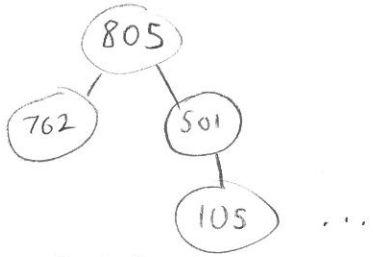
Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer 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, as this structure allows for objects to be sorted based on a priority value, as well as easy removal.

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

This structure could be implemented via a Heap/Tree



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): Python

Your solution:

```
count_chars(string_arg, character)
    int amt = 0
    for c in string_arg:
        if (c == character)
            amt += 1

    return amt
```

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:

I still do not understand how to calculate time complexity.

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)*
OSTEM	meetings / Seminars	10

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

An implicit bias formed by computers when working with large, diverse datasets

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

Admissions software giving a lower average merit score to students of lower economic statuses, as a result of a small subset of poorer students having lower grades

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:

Oracle would not be able to embargo an extremely widely used API that has been public for decades and is integrated in the Windows OS anyway

Second possible impact:

Stallman's movement for open software would have that much more ammo

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:

Software crashes/errors could put users in danger if they are not adequetly caught/handled

Second type of harm:

Software may be susceptible to breaches/security threats

Third type of harm:

People would hate not being able to drive due to pending software updates

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 I work for Quiq, a Bozeman-based company, as a frontend software engineering intern. They are still determining whether the company can afford to take me on as a permanent employee once I graduate, and if they don't, I will receive a reference and seek employment in the field elsewhere.

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)*
Ostem	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:

Gitlab

Non-trivial feature 1: View all branches, their organization and changes on a UI

Non-trivial feature 2: View extensive version history, including merge requests, rollbacks and pushes

Non-trivial feature 3: View associated story information (if connected to Jira)

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 Discord API to build a bot in Python	15 +

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Name Ethan SkeHon

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.

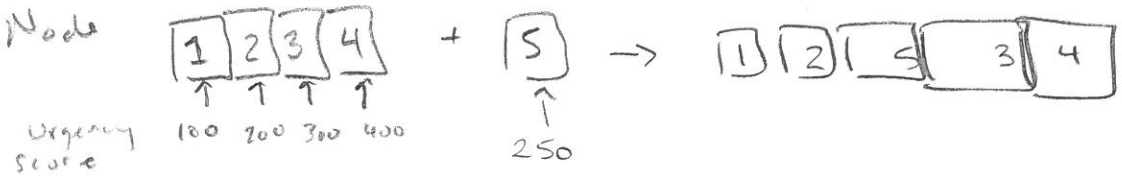
priority queue

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



have a queue from 1 to 10,000 nodes (urgency) place a person inside the queue based on their urgency if already put turn one lower, then pull from highest

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



Just have a simple queue where first spot is first to be picked with each node that has an associated urgency score. They are then placed inside the queue wherever their urgency is

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 char_Occurs( string , char ):
    count = 0
    for characters in string :
        if character == char :
            count += 1
        end if
    end for
    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:

k

Explanation of best case time complexity:

best case it can put k on the front each time so it only has to go through k times

Worst case time complexity of algorithm:

kn

Explanation of worst case time complexity:

worst case it has to put k nodes all the way on the end of 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)*
10Xwater	App / ML Dev	250
Blueprint	LLM Research	500

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

Algorithm bias is where a user has intentionally or unintentionally programmed the algorithm to act differently in different situations (race, ethnicity)

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

If a college admissions software has mostly white applicants then it may have some bias towards them or have a higher probability of letting them in compared to others

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:

If google wins it may cause more people to copy Javas code stealing its content and giving less purpose to copyrights

Second possible impact:

Companies will be much more careful in letting people use these code and be more secretive causing for less innovation

Third possible impact:

Companies might cause barricades to get their code causing new coders who want to learn a harder time to get into coding

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 → the software could cause people to be harmed or killed

Second type of harm:

mental → people might become more reliant on machines and less independent

Third type of harm:

legal → who is at fault for software errors and legal issues for physical crashes (driver, company programmer)

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 at Blueprint Consulting for the time being out of college. I am still interning there and they are seeing where I will fit. If that doesn't work I have a number of others I'll reach out to.

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*
4x4 Club	150
Bozo Bums	70
Trail Junkies	10

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:

Not sure that I use one regularly

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)*
1 Built a face recognition locking fridge	100
Building Astroids Game	100

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Name Emry Wilson

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. Tickets come in in order but then those w/ a higher urgency score would get bumped higher in the queue.

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



Linked list w/ a score value. When a new node comes in (new ticket) put it the spot where its score goes in the queue

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



You could do it w/ an array too but then you would need to make a new array each time so that is silly

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 char_in_string(char, string):
    char_count = 0
    for character in string:
        if character == char:
            char_count += 1

    return char_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(logn)

Explanation of best case time complexity:

Doesn't need to go through entire list to find where the K floating point numbers will go

Worst case time complexity of algorithm:

O(n)

Explanation of worst case time complexity:

Will need to go through entire list to find where the K floating point numbers will go

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	member	not very many
Brightwire	intern	3 months
Undergraduate Researcher	security stuff for CERIT + Blackthorne	1.5 years
Blackthorne	cloud security intern	6 months
Code Girls United Instructer	Taught middle school girls to code	6 months

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

Algorithms have properties that pull out some information more or work differently depending on the scenario

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

Present students w/ certain ethnicities, races, income, etc. + not others as much

Question 6: In 2010 Oracle sued Google claiming copyright and patent infringement for 11,500 lines of Java API copied code. Google used this small subset of code from the JAVA API for their mobile platform operating system. Pick a side (Google or Oracle) to win this lawsuit and explain 3 possible impacts to the computing industry of this win.

Side you choose to win: Google

First possible impact:

Supports open source software

Second possible impact:

Code will be written to be more reusable

Third possible impact:

Products may end up being more similar

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:

Miscalculation of space - rear end

Second type of harm:

Not identifying objects on road - hit something unexpected

Third type of harm:

Glitch + change speed rapidly - give drivers whiplash

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 currently working part time at Blackthorne Consulting as a Cloud Security Intern. I plan to keep working at them & start an online Cybersecurity masters program (Western Governors University - accepted)

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*
Journey Church	?, 3.5 years of stuff
Club sports team super fan	?

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)*
Undegraduate Researcher	1.5 years
Tarney church stuff	3.5 years

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: Rebasing after branches have diverged

Non-trivial feature 2: GUI & command line interfaces

Non-trivial feature 3: Used w/ GitLab & Github to develop CI/CD

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)*
Code First United Instructor	6 months
└reinforce my knowledge of CS topics	

Best wishes wrapping up the semester and in the future!

Woohoo thanks :)

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Name Man Ho Yuen

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.

list. store it by order

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

list : [0, 1, 2, ...]

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

stack



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:

```
for ( index in string ):
    If index == character :
        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 time

Explanation of best case time complexity:

do n time, no other thing do.

Worst case time complexity of algorithm:

n*k

Explanation of worst case time complexity:

add k to each 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)*
no	no	✓

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

a function

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

use function x*2 or x*2+1

to get tree child.

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:

codeing is similar.

Second possible impact:

idea can use by other people

Third possible impact:

code are public

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 get wrong and kill some one.

Second type of harm:

make driver very depend on self-driving

Third type of harm:

can't control the car.

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.

have not plan 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*

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:

Non-trivial feature 1:

git

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!