Montana State University Computer Science Department

Graduating Senior Exam

Academic Year 2022-2023, 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 Zach Jewett Mar 1, 23 -01911093

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.

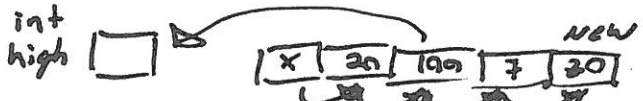
a) What simple data structure would best model this situation? Explain.

List of Ticket Objects.

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

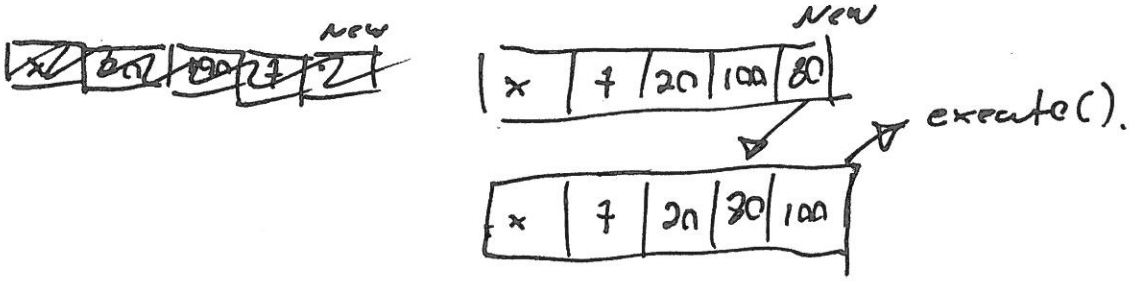
when request recieved add to list.

when ticket is complete, iterate from beginning to find highest. Then execute.



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

After adding new Ticket. Sort, then Pop and execute highest.



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

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

Your solution:

```
public int charCount(String str, char c){
    int count = 0;
    for (char letter: str){
        if (letter.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:

~~[illegible]~~ O(n)?

Explanation of best case time complexity:

I still struggle with this.

Worst case time complexity of algorithm:

$O(n^2)$

Explanation of worst case time complexity:

I can't, but I feel like it's hard to be worse than n^2

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

Organization	*Main Activities*	*Hours Spent (estimate)*
none	none	none

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

~~Guessing, I think that it has to do with [illegible] feedback loops [illegible] etc. have structurality thinking to~~

Guessing it refers to when provided training data is biased or incorrectly weighted

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

Rejecting qualified students based on a lack of, say extracurriculars, because the majority of accepted admissions participate in them. But idk.

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, but also programmers + the public

First possible impact:

Avoided Damage to OpenSource project/community

Second possible impact:

Oracle doesn't receive royalties anytime these API's are used.

Third possible impact:

Java remains accesible to everyone allowing more software to be developed and new people to enter the field.

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 - failing/defective software results in injury to driver, passenger, or others.

Second type of harm:

Financial - cost of damage to the owner, cost of liability to the car producer, probable loss of job for dev team, reduced product demand.

Third type of harm:

Trust - some people have a strong skepticism of advancing technology. While inevitable harm can lead to slower adaptation and innovation in the field.

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 work at Rosauer's. I don't see that changing.
Probably just work on personal projects.
no applications.

Wouldn't mind trying for a master's here once the new building is done, the staff is filled out, and the correct ~~degree~~ is offered specialization.

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

Organization Name	*Estimate Total Hours Spent*
none	none

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

Activity Description	*Hours Spent (estimate)*
None	None

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

Name of most sophisticated version control system:

OK at git through shells.
Mostly use terminal provided through IDEs

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)*
codecademy.com	40+
Books: Pragmatic Programmer Clean code, Architecture	~10
Unity projects/tutorials (C#)	A lot.
[illegible]	

Best wishes wrapping up the semester and in the future! Thanks.

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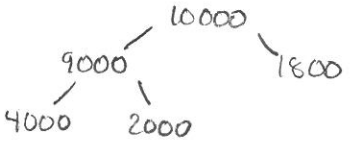
Name Brian Jore

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 based on the urgency score. The greatest urgency score would be the root and the other scores would proceed down the branches, so the greatest score would always be on top.

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): Python

Your solution:

```
char_finder(input, target):
    counter = 0
    for i in range(len(input))
        if input[i] == target:
            counter += 1
    return counter

searching = char_finder("String", "s")
```

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

Best case time complexity of algorithm:

O(1)

Explanation of best case time complexity:

The numbers would be added one at a time and then sorted to their correct position. This would take at least some small amount of time to sort them. At best, no time at all would be taken to sort.

Worst case time complexity of algorithm:

O(n)

Explanation of worst case time complexity:

At worst, the time to sort the new value would grow linearly depending on where the new number's place would be.

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 marching band	Playing trumpet during shows	1000 or more
S&K Electronics Intern	Working with the in-house database.	210

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

Where an algorithm sorting through input Coles could ignore or place less value on one Cole based on how the algorithm was written.

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

An algorithm looking at applicants from small towns vs large cities.

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: less restraint on what code is used in applications

Second possible impact: a greater need for new language creation to avoid copying of code by roval companies

Third possible impact: standardization of widely used algorithms or tools.

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, potential for accidents caused by bad system input,

Second type of harm: emotional harm: could make users uneasy since they would not be in control,

Third type of harm: economic harm: would cars sell as well if this became widely used?

Question 8: Describe your one-year plan following graduation. If you plan to work, list where you have applied (the company and the position) and mention whether you have received any offers. If you plan to go to graduate school, list where you have applied (the school and the area of study) and mention whether you have received any acceptances.

I intend to start working as soon as possible.

I have applied to Lockeed Martin as a software engineer, Raytheon as a software engineer, and Hill Airforce Base as part of their software engineering group. I received an intent to hire letter from Hill Airforce Base and am waiting for a formal yes or no.

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*
Intervarsity	200

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

Activity Description	*Hours Spent (estimate)*
Working in the dining halls	2560
Working for Enterprise	1560

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: ability to clone repositories to computer

Non-trivial feature 2: keeping track of commits to project files

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)*
Teaching myself arduinos	60
Teaching myself R	60

Best wishes wrapping up the semester and in the future!

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Name Andrea Kattine-Grimsley

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.

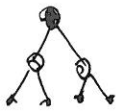
a) What simple data structure would best model this situation? Explain.

priority queue

Sorts items as they are added by priority.

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

A tree where the root has the highest priority.



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



As a sorted 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): python

Your solution:

```
def char_count (str, char):
    count=0
    for c in st
        if c==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(K)

Explanation of best case time complexity:

In the case where all K numbers are less than or greater than the values of the first n you simply add the new K numbers

Worst case time complexity of algorithm:

O((n+K)

Explanation of worst case time complexity:

The case where each number is not greater than or less than the min or max and you have to look through the whole ~~array~~ 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)*
Montana Space Grant Consortium	Research ML	500 hours
Teaching Assistant UMT MBA	Teaching Python	60-70 hours
Tadpull Internship	Machine Learning, Data Science	500 hours

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.
Errors in a algorithm that tend to favorable out coms for one group over another

b) Provide a hypothetical example of how algorithmic bias could manifest itself in college admissions software.
Giving a negative score base on geographic area

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:
Protection of Open Source

Second possible impact:
Reduction of use of open source by large compnies

Third possible impact:
A boss of open source

Question 7: In the ACM Code of Ethics and Professional Conduct, one ethical principle stated is to ***avoid harm***. Describe three different types of harm that the software of an autonomous, self-driving car might cause.

First type of harm:
Death or bodily harm

Second type of harm:
Property damage

Third type of harm:
Disruption of traffic

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 joined the Army. Upon graduating I ship to basic.

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*
Hacker Cab	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)*
Misc School 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: restore

Non-trivial feature 2: purge

Non-trivial feature 3: .gitignore

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 Neuromorphic Computing	200
Learning ML	500
Learning Cyber Security	100

Best wishes wrapping up the semester and in the future!

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Name Kirsten Keblish

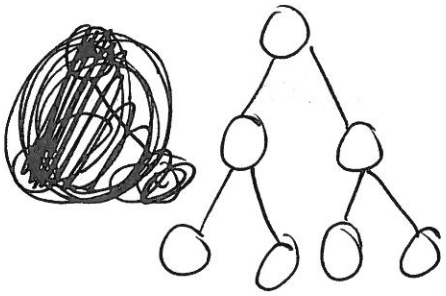
Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer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

Tree, fast to traverse through numbers because are organized

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

Highest urgency scores would be top of tree



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

~

It's been a long time somehow!

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

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

Your solution:

```
public int charNum ( string str, char c ) {
    int count = 0 ;
    for ( int i=0 ; i < str.length+1 ; i++ ) {
        if  str [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:

[redacted] n

Explanation of best case time complexity:

I don't remember!



Worst case time complexity of algorithm:

$n \cdot k$

Explanation of worst case time complexity:

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

Organization	*Main Activities*	*Hours Spent (estimate)*
TechLink	[redacted] Testing	400 +

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

The tendency of an algorithm to pick [redacted] select based on one variable maybe?

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

Only picks students based on GPA

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

Side you choose to win: Google

First possible impact: Being able to copy unoriginal code for profit

Second possible impact: Stealing of work/effort

Third possible impact: Code not being able to be patented/ copyrighted

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

Causing an accident

Second type of harm: emotional/mental harm

Making driving mistakes

Third type of harm: legal/financial

Breaking the law

Question 8: Describe your one-year plan following graduation. If you plan to work, list where you have applied (the company and the position) and mention whether you have received any offers. If you plan to go to graduate school, list where you have applied (the school and the area of study) and mention whether you have received any acceptances.

I'm going to take some time to just work the job I'm doing now and figure out what I want to do moving forward. → (care aide)

Computer science is my second degree and I'm not sure how I want to implement it in my life yet!

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

Organization Name	*Estimate Total Hours Spent*
None	

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

Activity Description	*Hours Spent (estimate)*
Wellness Club	30
Crochet group	10

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

Name of most sophisticated version control system: Gitlab

Non-trivial feature 1: merge reviews / approvals

Non-trivial feature 2: Task / issue boards

Non-trivial feature 3: customizable project wiki pages

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)*
[redacted]	

Best wishes wrapping up the semester and in the future!

Thank you!

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Name Brian Garrett Keith

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, this allows the tickets to generally get done in order, but a high priority ticket would jump to the front

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

Could be implimented w/ an array list always pull of the front, insert in priority order



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

Could be implimented w/ a 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): Python

Your solution:

```
Def char Count (character, String):
    charlist = [ ]   Count = 0
    for letter in String:
        if letter
        charist.append
        if letter == 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:

O(k)

Explanation of best case time complexity:

~~if k is the smallest in the list it will only take on~~

if all of k is smaller than all of N they will straight in with only on comparison each

Worst case time complexity of algorithm:

O(kn)

Explanation of worst case time complexity:

if every value of k is greater than every value of N, each value of k will have to be compared w each value of N inorder

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

Organization	*Main Activities*	*Hours Spent (estimate)*
literally none		

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

literally never heard that term before in my life

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:
Sets precident for stealing from Oracle being ok

Second possible impact:
everyone is now allowed to steal from Oracle

Third possible impact:
everyone is now allowed to steal from all big tech companies (I'm looking at you Adobe)

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: literally kill Someone through sentient vehicular manslaughter

Second type of harm: not allow a pregnant woman to speed to the hospital forcing her child to be born in a tesla, there is no worse fate for a child.

Third type of harm: lock malfunction trapping someone in their car and cooking 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.

for the next year I plan on skiing, hiking, flying, and in general going on as many cool adventures as possible. probably live in my car for a little while and travel around. I will not become a slave to the corporate capitalist machine.

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*
I went camping with my friends	+1000
is drinking an activity?	

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)*
Met new people	I dunno like 10

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

Name of most sophisticated version control system: Git hub

Non-trivial feature 1: Different Branches

Non-trivial feature 2: Multiple endpoint access

Non-trivial feature 3: high level public/private access & collaborator control

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)*
Made a ton of dumb mobil games	100

Best wishes wrapping up the semester and in the future!

this may sound insane but every answer here is sincere

Montana State University Computer Science Department

Graduating Senior Exam

Academic Year 2022-2023, 80 minutes.

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Name Ali khaef

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.

we can use any type of sorting algorithms to find out about Priority on our tickets. for example we can use merge sort and based on 1-10000 we can sort of the tickets with more Priority

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

lets say we have 5 ticket "1" "9" "23" "10000" "53 49"

no we can use our merge sort algorithm to sort our tickets based on their given number.



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

another we can think about this is by using a binary tree and set our Priorities based on that



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

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

Your solution: JavA

```
Public Void test (string A1, char A2)
    int count
    iF (A2 == true)
    { 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(n)

Explanation of best case time complexity:

based on what i remember the best time complexity on a singly linked list is o(n)

Worst case time complexity of algorithm:

n!

Explanation of worst case time complexity:

I'm not 100% sure on this, but i think n! is the worst 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)*
Computer science tutor	tutored in C Programming	40 hours
MSU cafeteria staff	food preparation	60 hours

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

whenever there is a bug or error in our application we call it bias.

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

an error on entering students grade into degree works which makes students to be able to change their grades manually

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:

using a small Parton of a program to create a new application is fine as long as the end Product is different

Second possible impact:

Google is a big company with lots of open source materiels - that Parton might even been coded by google

Third possible impact:

a company like google is famous and big enough to not get infected by a company like oracle.

Question 7: In the ACM Code of Ethics and Professional Conduct, one ethical principle stated is to ***avoid harm***. Describe three different types of harm that the software of an autonomous, self-driving car might cause.

First type of harm:

self driving cause into accident and damage the People insige or vehicle

Second type of harm:

the program which controls the system gets virus and not be secure anymore

Third type of harm:

the program becomes out of control of the owner

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.

based on my current situation, my country is at war and i realy don't know what my next step is. i realy need some time to think and see what im gonna do.

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*
graice bible church	100 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)*
msa catherine	100 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:

git bash

Non-trivial feature 1:

some of the Basic commands that are differe between operating system like linux and windows

cd, dir

Non-trivial feature 2:

during my studying years i only use windows cmd and github and gitbash and i really tried to learn it and did not try to find any replacement

Non-trivial feature 3:

for it therfor i really dont have anything specific to talk about here and overall i like gitbash and their commands

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	200 hours
udacity	100 hours
Udemy	120 hours

Best wishes wrapping up the semester and in the future!

Montana State University Computer Science Department

Graduating Senior Exam

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Name Caitlynn Koback

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 hashmap would be easy to sort and retrieve the tickets from, assuming the tickets are mapped by the urgency score.

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

By mapping the tickets using the urgency score, the system can find the tickets stored at the highest urgency score.

Score 1: Ticket 1, Ticket 2
Score 2: Ticket 3, Ticket 4, Ticket 5
⋮
Score 10,000: Ticket 10,000

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): Java

Your solution:

```
fun 1  int strCount (String word, Char c) {
    int count = 0;
    for (int i = 0; i < word.length; i++) {
        if (word[i] == c) {
            count++;
        }
    }
    return count;
}
```

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

Best case time complexity of algorithm:

$\Theta(1)$

Explanation of best case time complexity:

If the number is less than the first number of the list, the number only needs to be connected to the front of the list, which is constant run time.

Worst case time complexity of algorithm:

$\Theta(n)$ $\Theta \log n$

Explanation of worst case time complexity:

1) Assuming the algorithm iterates through the list to sort the new additions, the worst case is the newer number is added at the end of the list, which means it counted through all n numbers.

2) $\Theta \log(n)$ run time can be achieved by going throug the list by halves start at the middle, if the number is smalle address the left half, larger : right half. Continue this throug the list until the new number has found it's place.

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.

Algorithmic bias is when an algorithm is designed in a way that creates a bias towards specific output, can often reflect the designers bias.

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

Assuming the software is looking for higher GPAs, the algorithm can lean towards students who have heavily weighted classes, i.e the GPA can be greater than 4.0. This can exclude students who's schools don't have weighted GPAs, even though they have perfect grades, i.e a 4.0.

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

Side you choose to win:

First possible impact:

Second possible impact:

Third possible impact:

Question 7: In the ACM Code of Ethics and Professional Conduct, one ethical principle stated is to ***avoid harm***. Describe three different types of harm that the software of an autonomous, self-driving car might cause.

First type of harm:

Physical injury to passengers in the car

Second type of harm:

Property damage to the city or other cars

Third type of harm:

A dealer gets sued due to their cars having bugs in the software

Question 8: Describe your one-year plan following graduation. If you plan to work, list where you have applied (the company and the position) and mention whether you have received any offers. If you plan to go to graduate school, list where you have applied (the school and the area of study) and mention whether you have received any acceptances.

Currently work at Hot Spring Pools and Spas, will continue to work there while searching for other jobs. Have not received offers at this 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:

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)*
Taught myself Javascript	45 h
Taught myself React-Native	15 h

Best wishes wrapping up the semester and in the future!

Montana State University Computer Science Department

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Name Tyler Koon

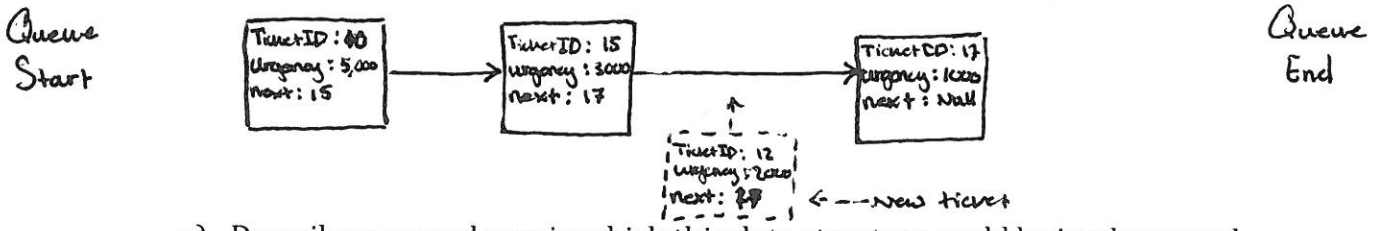
Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer 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 queue data structure could be used in this situation, as it offers a simple interface for maintaining the order of tickets in the system; new tickets can be added to the end of the queue, and processed tickets can be removed from the beginning of the queue. Thus, order is persisted. Additionally, new tickets could be inserted in the correct location in the queue based on urgency score by performing a simple linear scan and insertion.

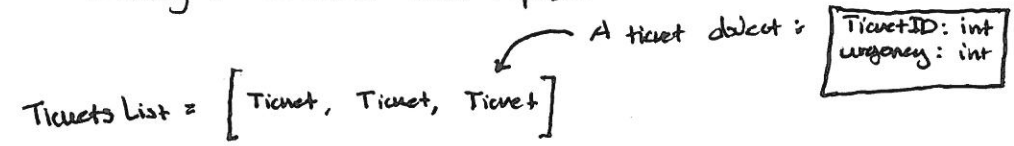
b) Describe one way in which this data structure could be implemented and draw a picture of that data structure.

One way to implement this queue is through a single linked list structure, with each node representing an element/ticket.



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

Another way with which the queue could be implemented is through a primitive list or array structure, with each element in the list pointing to an object that represents the a ticket.



List is sorted by priority, and new tickets are inserted by scanning through the list and performing an insert operation at the location ~~from~~ appropriate for the given urgency. Depending on the direction of sort, tickets can be consumed from the front or back of the list.

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

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

Your solution:

```
def count_occurrences(string, char):
    """
    Count the number of occurrences of a character in a given string

    Parameters:
    string : str
        The string with which to ~~count~~ search
    char : str
        The character to search for

    Returns:
    An integer representing the number of occurences of the character
    in the given string
    """
    #variable to store number of occurrences
    count = 0

    #for each character in the string, check if it equals the given char
    for character in string.lower():
        if character.lower() == 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(1)

Explanation of best case time complexity:

In the best case, the element being added to the list will ~~be~~ be smaller than every element already in the list. Thus, the only the first element in the list would have to be checked before inserting the new element at the front of the list. Because only one element would need to be checked in this optimal case, the time complexity is constant.

Worst case time complexity of algorithm:

O(n)

Explanation of worst case time complexity:

In the worst case, the element being added to the list will be larger than every element already in the list. Thus, all n elements would need to be compared to the new element before inserting the new element at the end of the list. Because every element would need to be considered in this worst case scenario, the time complexity is proportional to the number of elements in the list (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)*
MSU Bobcats	Developing autonomous systems Presenting/teaching new material	75 hours
MilTech Soft. Eng. Intern	Full stack development System architecting/design	1250 hours

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

Algorithmic bias is the presence of a bias or preference in the output of an algorithm that ~~becomes or impacts~~ puts members of certain demographics at a disadvantage compared to other demographics. Also This bias is usually the result of how the algorith was designed or trained.

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

Perhaps the admissions software implements some algorithm that consumes characteristics about an applicant (such as race, gender, socio-economic status, ~~etc.), and makes a prediction about~~ extracirricular involvement, etc.), and makes a prediction on how likely that student is to succeed at the university. If the algorithm was developed or trained using data that did not accurately represent all categories of applicants (for example, maybe historical data of students was used to develop the model, but due to external factors, certain groups were historically under-represented at that university), then those applicants in those underrepresented categories may recieve a lower prediction for success, affecting application selection processes. ↑ unjustly

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:

The scope of 'fair-use' and 'transformative work' in ~~software~~ the industry would likely expand, allowing developers more power with regards to how they interact with closed-source software.

Second possible impact:

There would likely be new considerations with regards to how software and software systems are licensed for personal and commercial use (perhaps some new license formats will be introduced that are more specific about how/if the affected software can/can not be used).

Third possible impact:

The question of whether public-facing APIs built for free/public software systems be answered once and for all; ~~be copied~~. It may become much more difficult for public APIs to be legally "protected"/copywritten.

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 - Improper development and implementation could result in dangerous conditions for pedestrians, other vehicle operators, and occupants of the self-driving cars through ~~crashes and~~ or traffic accidents.

Second type of harm:

Employment - The introduction of self-driving vehicles could remove demand for delivery drivers, and have negative effect on employment in transportation and shipping industries.

Third type of harm:

Social Harm - Could result in socio-economic division (i.e. these vehicles provide significant advantage, but are only obtainable by persons of certain statures), and could introduce novel scenarios that ~~cause~~ legal harm to affected individuals (new lawsuits that pose novel and unprecedented questions).

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.

Following my graduation, I plan to work as a software engineer for MilTech (have been offered a position), where I will help develop the Virtual Industry Day platform, and ~~built~~ guide the construction of a general purpose software team. During this time, I also plan to attend graduate school part-time, where I will be pursuing a masters in Data Science. I have currently applied to Northwestern University and the University of Washington, and am awaiting a decision from both institutions.

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 Robocats Community Presentations	2 Hours
FIRST Lego League Competition Judge	5 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)*
Robocats - Working with multidisciplinary teams	75 Hours
EGEN 310R - Designing/building w/ multidisciplinary teams of different skill	50 Hours
Hiltech Intern - Working with developers and investors	1250 Hours
Honors College - Discussing/collaborating with peers from different disciplines	120 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:

Git

Non-trivial feature 1:

Branching/Merging - Isolating the development of a feature in a parallel branch (copy of main codebase), and then merging those changes back into the main codebase upon completion of the feature.

Non-trivial feature 2:

Conflict Detection and Remediation - Identifying code conflicts and automatically resolving or presenting them. Additionally, exposes features like .gitignore files for ~~prevention~~ a more controlled development experience.

Non-trivial feature 3:

Collaboration - ~~Easy for multi~~ Support for multiple collaborators through branching/committing (useful features like git blame, commit messages, etc.)

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 MSU Honors Present Lectures	10 Hours
Attended MSU RMDS seminar	1 Hour
Attended MSU TAILS Seminar	5 Hours

Best wishes wrapping up the semester and in the future!

Montana State University Computer Science Department

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Name Alexander Krings

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.

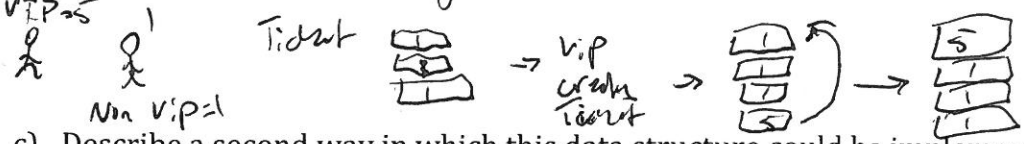
a) What simple data structure would best model this situation? Explain.

A priority queue. → ~~Gives a higher priority~~ Brings higher priority items to the top.

(I need to brush up on my data struct.)

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

One way you could implement this would be to assign values to high priority people and when they create ticket it gets sent to the top.



I see this is wrong now.

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

~~Another way that I would implement it is~~

~~Drawn blanking on this one.~~

You could have it where it (the tickets) come in non-sorted

And then sort when you need to.

But I am blanking on a good <PQ> implementation

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:

```
a = "hello world"
b = "l"

string   char
  ↓       ↓
def fun(a , b):
    # Blanking on the way to splice a string.
    ~~myArr = {}~~
    counter = 0
    for i in a:  # pretty sure this is valid in Python.
        if(i==b):  # if not valid I would create an array
            counter = counter +1  # to hold the values of A.

    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:

The best case would be ~~O(A)~~ O(n+k)

Explanation of best case time complexity:

~~The best case of this is that the~~

I think it would be this, because best case it only has to check each number once, when adding the additional k.

But it still has to add each k value.

Worst case time complexity of algorithm:

Would it not be ~~the~~ the same?

Explanation of worst case time complexity:

It would be my above answer.

Worst case it has to check every # till it finds it's spot.

So would best case just mean that it just happens to only check the first one each time?

Meaning best case would be O(k+1)

And worst case is ~~the~~ O(n+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)*
—		

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

This is an (usually) unintentional bias when humans are programming an algo and bring their bias into it.

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

Hypothetical: If a racist were creating the software they could add bias so that weighs "their persons" Person more. Which would create bias.

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 -> but IDK.

First possible impact:
Google starts stealing from more companies.

Second possible impact:
Other companies steal from oracle.

Third possible impact:
Oracle goes out of 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:
Harm to the driver if it incorrectly senses/sees an object causing the car to crash into something.

Second type of harm:
Harm to others -> If it again malfunctions causing an accident that either harms another driver or pedestrian.

Third type of harm: ?

~~Harm to the company~~? Harm to computing.
It could set ~~back~~ back further advancements in Autonomous ~~car~~ driving

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.

Applied:

Onx - nope

Aurora - nope

TikTok - nope

Cognizant - yes

MSU

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 Hub

Non-trivial feature 1:

Push

Non-trivial feature 2:

Pull

Non-trivial feature 3:

-help :

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!

Thanks

Montana State University Computer Science Department

Graduating Senior Exam

Academic Year 2022-2023, 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 Thor Lancaster

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 / heap would allow quick access to the highest priority ticket

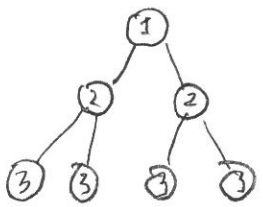
O(Log n)

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



Binary Heap.
Number represents Level.

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



Object-Oriented tree
I would prefer the binary heap because no pointer dereferencing is required.

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 count (char c, String s) {
  int rtn = 0;
  for (int x=0; x < s.length; x++) {
    if (s.charAt(x) == c)
      rtn ++;
  }
  return rtn;
}
```

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:

Each added number is less than the smallest item in the list.

Worst case time complexity of algorithm: [Also average]

O(n)

Explanation of worst case time complexity:

Each added number is more than the largest item in 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)*
Smarty Cats	Individual / Group Tutor	150
Bridger Solar Team	E.E. / C.S.	80

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

An algorithm, often a machine learning algorithm, discriminating against people for things they can't change.

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

An Admission-Scoring Neural Network is trained on a dataset that includes household income. It would discriminate against poorer, higher acheiving students.

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 Software developers being less afraid to extend proprietary languages and standards.

Second possible impact:
Greater Compatibility of technological products [Phones, Kindle, Smart TVs =: APK].

Third possible impact:
Greater adoption of the formerly Copyrighted API.

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: Experience a malfunction that endangers the driver, passengers, or other road users.

Second type of harm: Leak private data to unauthorized parties.

Third type of harm: Drive too aggressively, disincentivising people from driving themselves and coercing road users into buying the software.

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 a co-founder of Electron, a startup developing high-performance LEV Products. We currently have a prototype Motor Controller / Inverter that is the size of 2 stacked Samsung Galaxy S9 smartphones and can supply 500A at 85V max.

After graduation, I plan to work on Electron 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*
MSU Running Club	60
BJJ @ Montana MMA	500

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)*
EE/CS @ Bridger Solar Team	80
EGEN 310	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:

Branching allows different test versions to be developed simultaneously.

Non-trivial feature 2:

I don't use any other advanced features.

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)*
Statcastr Live Scoreboard	80
[JavaScript + C++ Backend]	
Pre - Electron	150
Motor Controller R+D	

Best wishes wrapping up the semester and in the future!

Montana State University Computer Science Department

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Name Armand LaPlume

Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer service team needs a way to find the most urgent ticket in the system and remove it when it has been addressed. New tickets can arrive at any time.

a) What simple data structure would best model this situation? Explain.
A sorted array. You can use a binary search to quickly add and remove tickets.

b) Describe one way in which this data structure could be implemented and draw a picture of that data structure.
Sort the items initially then use a binary search to insert and remove tickets quickly.



c) Describe a second way in which this data structure could be implemented and draw a picture of that data structure.
A less effective way would be an unsorted array.



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

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

Your solution:

```
def foo(str, x):
    count = 0
    for i in str:
        if i == 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: 1

Explanation of best case time complexity:
Best case senario is each number fits in exactly the first place you check

Worst case time complexity of algorithm: k•n

Explanation of worst case time complexity:
Every number belongs at the back of the list and since it's singly linked you have to look through every number currently in 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)*
N/A	N/A	N/A

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.
a bias in an algorithm

b) Provide a hypothetical example of how algorithmic bias could manifest itself in college admissions software.
The software could discriminate based on race

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

Side you choose to win: Google

First possible impact: People will be able to more easily develop cool things by copying code from other places

Second possible impact: People or corporations will be more stingy with sharing code

Third possible impact: Oracle fans will hate google

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: Could harm pedestrians or driver if it malfunctions and crashes.

Second type of harm: Could harm the established car industry.

Third type of harm: Could put drivers out of jobs. (truckers, uber, taxi drivers)

Question 8: Describe your one-year plan following graduation. If you plan to work, list where you have applied (the company and the position) and mention whether you have received any offers. If you plan to go to graduate school, list where you have applied (the school and the area of study) and mention whether you have received any acceptances.

Work, haven't applied anywhere 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*
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)*
EGEN 310 project	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:

fork

Non-trivial feature 2:

clone

Non-trivial feature 3:

add collaborators

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)*
Watching interesting CS Youtube videos	20

Best wishes wrapping up the semester and in the future!

Montana State University Computer Science Department

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Name James Lucas f72f751

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.

The best data structure would be an array of customer objects.

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

you could have the person as an object, associated with their ticket urgency score that all live in an array.

[customer1, customer2, ..., customerN]

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

You could hold their names along with their score.

[[John smith, 100], [Catie atwood, 400]...]

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 characterCount(sentence, character):
    count = 0
    for letter in sentence:
        if(letter == 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:

O(1)

Explanation of best case time complexity:

You can put the number in the current position that you start in

Worst case time complexity of algorithm:

O(n+1)

Explanation of worst case time complexity:

You have to put the number at the end of the list. So, you have to check all of the numbers and put your value at the end.

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 an algorithm has to favor an outcome in order to come to a decision. Mostly used in nueral net training.

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

It could select people that may benefit the school, rather than on the person's merits.

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:

Shows that code is worth more than copy paste.

Second possible impact:

Laws that protect code more.

Third possible impact:

People would feel more compelled to write their own 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:

Run someone over.

Second type of harm:

Make people late because of wrong routing.

Third type of harm:

Could stranded you if it runs out of battery.

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 like to work as a backend dev. I have tried Google and Oracle, along with apple, But nothing back so far.

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

Organization Name	*Estimate Total Hours Spent*
X	X

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)*
x	x

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:

command line integration.

Non-trivial feature 2:

easy to access (git for windows) git bash.

Non-trivial feature 3:

cloned repos that allow branching for testing work.

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)*
x	x

Best wishes wrapping up the semester and in the future!

Thanks!

Montana State University Computer Science Department

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Name Mornie Manning

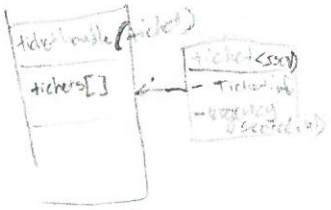
Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer 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 suppose someone could use a sorted tree of some kind. Data structures were never my best subject. Using a tree, or something that kept the data in a sortable format that has tested algorithms for a quick search would be good.

(Maybe a stack of some kind)

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 as a variety of things, as long as it could have some way to keep track of the beginning and end of the list of scores. For example, you could probably create ticket objects that could be stored say in SQL, that could then be placed in a data base or a list array if read into a program.

(I know this is a bad answer because I do not know what to draw)

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

wish we had more trivial, low stakes, & early introduction to higher concept data structures

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 charInString(inputStr, searchChar):
    count = 0
    for char in inputStr:
        if char == searchChar:
            count += 1
    return count
```

Personally, I would google so double check if you could use a key word like 'in' do see if a char is in a string in python. Since I think python views strings as an array of chars. (hopefully not mixing up w/ Java), I am assuming this is true.

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:

Assuming the function to add a value into the function must search through the whole list (n), & any value that might be added after also needs to be searched through, then the best-case scenario is that the new float k is always the smallest number, so it takes k amount of time.

Worst case time complexity of algorithm:

can't remember the notation for the worst case

$O(k \cdot n + k-1!)$ I think how you notate factorial, like, 1+2+3 etc.

Explanation of worst case time complexity:

You have to go through the whole list (n), k times (for each element added), and that element gets larger by one after every search ($+ k-1!$). This is some time less than $O(n \cdot n)$ aka, $O(n^2)$.

4.4 = 36

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.

I assume is what I did during

Organization	*Main Activities*	*Hours Spent (estimate)*
Jewish Student Association	President, founder. community organizing & liason.	400+ hrs (Been running since 2018)
Queer Straight Alliance	Social media coordinator, ran club, created sign guide, ran meetings, project management	200+ hours easily
AWC	Vice president, helped with meetings, assisted president, provided expertise(?)	20-40 hrs.
Paid Undergrad Course asst.	helped students, graded hw, held office hours for the class	40+hrs (cant remember well)
Credit Undergrad course asst.	helped students in lab, explained concepts, assisted the GTA. for basic data structures & algorithms	30+hrs "
Volunteer tutor at the CS help center	helped students who came to the CS help center, helped debugg & work through concepts with students of varying levels	40+hrs "
Undergrad research asst.	worked in a joint CS & Plant Bio lab using lasers to look at certain plant DNA. working w/ the stylite super computer.	120+hrs "
Orientation leader	Helped guide freshmen to the CS department through orientation at MSU. Prepared them for the course.	200-300+ hrs

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

Algorithmic Bias is when software can be biased against things/people usually for unintentional reasons. This might show up in things like facial recognition software having a harder time recognizing black people (more of a data set thing), or something like people from lower income neighborhoods being less likely to get loans from loan software.

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

There are many ways algorithmic Bias could manifest in college admissions. For example, say the person writing the software was told to only accept the most qualified students. They viewed most qualified to be the best GPA & weighted this heavily in their software. This would always be more likely to accept students from schools that have GPA scales that extend past the 4.0 scale (as some schools do) & we would see less students with good GPAs from schools without the 4.0+ system.

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 likely not maintain exclusivity of the code, via their patent, (patent not valid) In other words, other companies could use the API code without as much fear in being sued.

Second possible impact:

this may throw into question other patents on code, both for Oracle inspecific but also in general. There would need to be more legal cases to determine the boundaries of what code is always not always to use legally.

Third possible impact:

More companies would keep their code close source in fear of it being stolen & not being able to do anything about 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:

The software might drive into someone & kill them.

Second type of harm:

The software could drive into structures / infrastructure & cause destruction/loss of property.

Third type of harm:

The car could turn on in an enclosed space & release carbon monoxide which could kill an unsuspecting person.

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 no idea what my 1 year plan is except that I must graduate, I have been in school for far too long.

School makes it hard to plan whats next. I would like to work, I have applied & am currently interviewing with SoFi. My mother would like me to find a tech job, though I may try to work a unique 1 year position with a Yiddish library to manage their databases.

I hope to find more potential job opportunities.

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*
OSTEM (not entire)	70+ hours (probably underestimate)
temple Beth Shalom	200+ hours

Any org. that was on the previous list I was also an active member of.

Also other countless clubs I have been involved with for short to times like BSU, Tabletop brigade, Tabletop adventuring guild, etc.

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.

Not whole time but impactful things

Activity Description	*Hours Spent (estimate)*
Helped run GSA as social media coordinator, I had to help project manage a diverse team w/ different life experiences	200+ hours
Not exactly an activity, but the EGEN 310 class has been mildly useful when working in teams & with clients for getting ideas across & improving communication.	100+ hours (Don't remember much)

So many of the other things I have listed but I do not want to write them out.

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

Not sure what non-trivial means in context.

Not sure if this is the type of answer you want.

Non-trivial feature 1: Branches

Lets you maintain multiple concurrent branches at a given time

Non-trivial feature 2: Stashing

Allows you to stash all changes you have made & return to the last point you got code from the main branch.

Non-trivial feature 3: forking

Allows you to make a complete copy of any repository of 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)*
Volunteer tutor at the CS help center let me gain confidence as a programmer with solving CS problems & reading code.	40+ hrs
occasionally went to CS talks or grad student talks	10< hours

Best wishes wrapping up the semester and in the future!

Montana State University Computer Science Department

Graduating Senior Exam

Academic Year 2022-2023, 80 minutes.

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Name Robert J Marsh

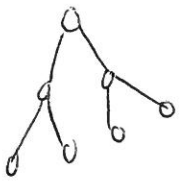
Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer 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 will be best - it can efficiently keep track of ~~ord~~ tickets such that the most urgent is accessible in O(1) time, new tickets can be added (and "sorted" in O(log n) time, and tickets with the same score are handled first-come-first serve

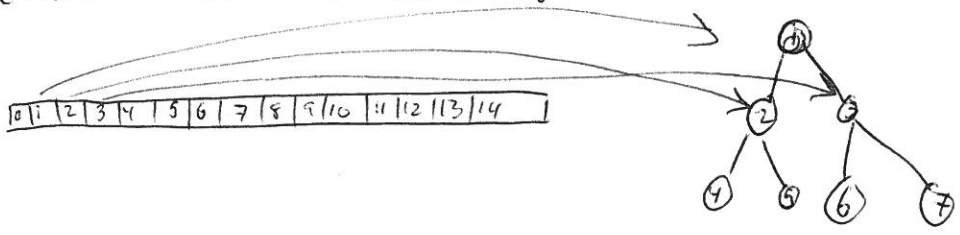
b) Describe one way in which this data structure could be implemented and draw a picture of that data structure.

This could be implemented with a binary tree (which can be implemented with a Tree/Node class)



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

This could be implemented in an array, s.t. the ~~a node's children are located~~ children of an index i are located at 2i and 2i+1



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:

```
characterCount (c, s):
    count = 0
    for letter in s:
        if letter == c:
            count += 1

    return count
```

w

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

Best case time complexity of algorithm:

$O(k)$

Explanation of best case time complexity:

In the best case, ~~* is sorted in descending~~ the added k numbers are added in descending order, and are smaller than all n. Thus, each new number is added to the head of the list, This requires checking the front of the list and adding the new number only k times.

1+2+3+...+2

Worst case time complexity of algorithm:

~~$O(n+k)$~~ ~~$O(k^2n)$~~ $O(k^2n)$

Explanation of worst case time complexity:

At the worst case, k is in ascending order and larger than all n. Thus, one must navigate ~~from~~ through all n numbers, and all ~~k~~ previous k, for each k. So ~~the~~ it requires ~~n+1 ... n+1~~ n, n+1, n+2, n+3, ..., n+k-1 operations to add all 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)*
Mackay Sposito	Web Development / Intern	200
Belvedere Trading	Software Engineer Intern	400
ACM	ACM meetings	40

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

Algorithmic bias is when the data used to train or create an algorithm is biased, creating a biased output.

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

If college admissions software created an algorithm for determining student success (and thus whether to admit students) using only information from urban colleges in major cities, the data might not accurately reflect the students in rural areas (and thus be biased and a poor predictor of student success).

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

Side you choose to win: Google

First possible impact:

increase in Open-source software due to 3rd parties now being able to copy any code they choose

Second possible impact:

decrease in open-source software due to copyright holders wishing ~~to~~ maintain their rights to the code and competitive advantage

Third possible impact:

increase in ~~the~~ society's overall ~~the~~ code capabilities and productivity due to ~~free~~ improved access to existing 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:

It might choose to kill pedestrians, in order to save the driver

Second type of harm:

It might choose to kill the driver to save "important" pedestrians, like babies or the President

Third type of harm:

It takes away a driver's ~~right~~ right to choose who to run over in a car crash

Question 8: Describe your one-year plan following graduation. If you plan to work, list where you have applied (the company and the position) and mention whether you have received any offers. If you plan to go to graduate school, list where you have applied (the school and the area of study) and mention whether you have received any acceptances.

I will be starting as a Software Engineer at Belvedere Trading, a market-maker and options/futures trading firm, in August.

I interned there last summer and recieved a return offer.

Mostly C++.

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)*
Intermediate Technical Writing	60
EGEN 310	75
ESOF 423 CA	120

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:

~~commit~~ hashing of commits to confirm security / correctness

Non-trivial feature 2:

Branching

Non-trivial feature 3:

pruning / rollback / stashing

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)*
~~I Te~~ learn C# / Unity	40
Set up bots on a cloud serv	40
Serve / version management for games	40

Best wishes wrapping up the semester and in the future!

Montana State University Computer Science Department

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Name Mason Mellard

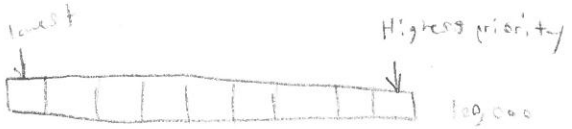
Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer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

using an array we could add the highest priority ticket to the end of the array then remove when needed

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

we can store each ticket created in the array depending on urgency



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

we could also use a linked list by having the higher priority items append to the beginning of the list and lower priority append to the end



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 Occurences(String, char):
list = []
count = 0
  for i in len(string):
    list[i] = string.current char

for j in len(String)
  if list[j] = char
    count ++
return count
```

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

Best case time complexity of algorithm:

O(K)

Explanation of best case time complexity:

If N and K are both sorted and in correct order need to do is add the new element and set to the new end

Worst case time complexity of algorithm:

O(n+k)

Explanation of worst case time complexity:

If we don't know order we must traverse the list and sort it for each new value in 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)*
oracle	Software Intern	2,000
BYE	Leadership Mentor	500
Undergrad Assistant	Course Assistance	500
Latin American Engineers	Group Meetings	200

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

Algorithmic Bias is the bias imported upon an algorithm from it's creator, i.e selecting a greedy approach to solving a problem like a sudoku puzzle as opposed to backtracking

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

Bias could manifest in the form of selecting higher income or GPA students over those with lower income and GPA,

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

Side you choose to win:

Oracle

First possible impact:

Less open source code

Second possible impact:

Monopolistic practices over software

Third possible impact:

Less original 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:

Endangerment of human life

Second type of harm:

Destruction of Property

Third type of harm:

Destruction of 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.

I plan to stay in Bozeman and work for Oracle as a full time Cloud Engineer. I was offered a position and will take it.

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*
Montana State Chorale	1,000
Ultimate Frisbee team	500

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)*
Egen 310 R	80
Montana state chorale	1,000

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

Name of most sophisticated version control system:

Oracle Scm

Non-trivial feature 1:

Scm of any file within the Oracle domain.

Non-trivial feature 2:

Easy replication and setup of repositories

Non-trivial feature 3:

Web hooks built-in

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)*
Video Game Development	2,000
Learning C#	400

Best wishes wrapping up the semester and in the future!

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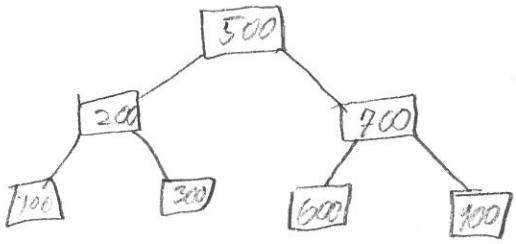
Name Ana Meyerdierks

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.

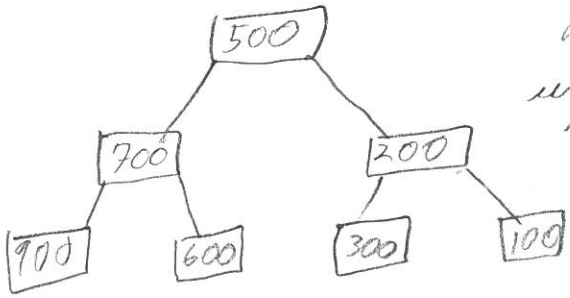
Binary search tree, as it would be self-balancing, which would be optimal for storing ordered data.

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



Right balancing, so higher urgency scores go on the right.

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



Left balancing, where higher urgency scores go on the left.

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 occurances(query, target):
    counter = 0
    for character in query:
        if character == target:
            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:

$O(k)$

Explanation of best case time complexity:

Best case, each number that is added is smaller than the current head, and therefore can become the new head. This is a linear operation that would occur k times, making the time complexity $O(k)$ in the best case.

Worst case time complexity of algorithm:

$O(n \cdot k)$

Explanation of worst case time complexity:

Worst case, each new number is larger than the previous and every other number currently in the list, and therefore the entire list would need to be traversed 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)*
ACM	Events, meetings	3
Wellness Committee	Events	8

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

An algorithm may begin to associate behaviors and trends and tie them to characteristics upon which they may not apply, such as race and economic status.

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

An algorithm may show favoritism to asian students due to trends in average GPA and may begin to adversely associate the two.

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 code becomes more widely adopted and used by larger companies.

Second possible impact:
Companies become even less open on their proprietary code, so as not to give their competitors an advantage.

Third possible impact:
More proprietary languages are developed to reduce incentive to use others' 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: Financial

Bug damages vehicle.

Second type of harm: Physical

Occupant injured in crash due to bug.

Third type of harm: Personal

User data may be lost in breach due to bug.

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.

Following graduation, I plan to work at Jost Enterprises, where I am currently employed as a Solutions Developer.

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*
MSB Church	300

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)*
Destiny 2	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: Search

Non-trivial feature 2: Format patch

Non-trivial feature 3: Pull repository

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)*
MBTI Program Construction	100
Youtube (as it pertains to coding)	400
Other Projects	60

Best wishes wrapping up the semester and in the future!

Montana State University Computer Science Department

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Name Cole Milne 02706895

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.

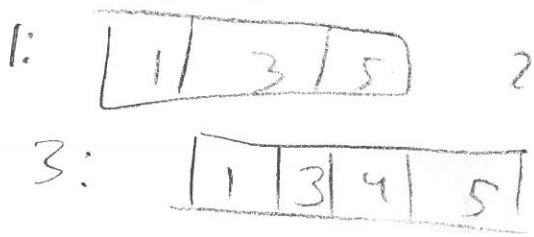
An array because a list of items that needed to be sorted can be easily done with an array.

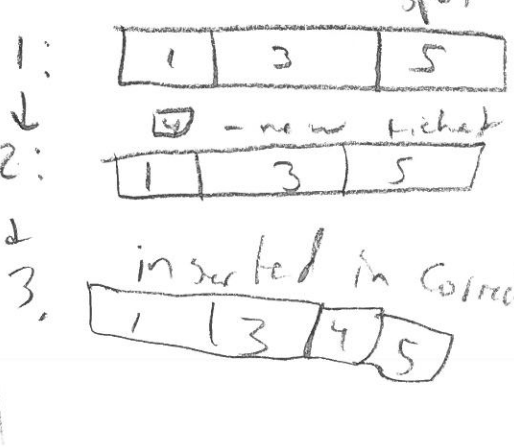
b) Describe one way in which this data structure could be implemented and draw a picture of that data structure.

We would have an array that is empty and then once a few tickets can through it would need to be sorted and then all tickets after would need to be inserted in the right spot

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

We could append each ticket then sort each time a ticket is appended





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 charCount(c, s):
    strArr = s.split('')
    count = 0
    for chr in strArr:
        if c == chr:
            count += 1

    return count
```

1
2
3
4

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:

This would be that the end of the list is where the given new float needs to be to maintain the ascending order.

Worst case time complexity of algorithm:

$O(k \cdot n)$

Explanation of worst case time complexity:

It could occur where n number of shifts to maintain order need to occur k amount of times to maintain ascending order.

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)*
Sigma Alpha Epsilon	Organized volunteer	Countless
- Service chair	events, created philan-	
- Philanthropy Chair	thropy events for	
- Eminent Recorder	charity, recruited	
- Recruitment Committee	new members,	
- Eminent Herald	and more	
Defens Distributed Interac	Made fullstack app demo	15hr/week
Zoot (Part-time) Developer	Building solutions for Zoot's clients	20hr/week

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

The inflated weighing of a particular variable/ input(s).

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

An example could be that SAT scores are weighted too heavily and kids with lower SAT scores but more useful extracurricular activities are accepted less than if the system was automated.

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:

Licenses on code have less impact

Second possible impact:

Code is not considered intellectual property

Third possible impact:

The "sharing" of code is more normalized in 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:

Choosing to harm one obstacle over another when crashing into one is a given.

Second type of harm:

Overriding safety laws to operate more efficiently

Third type of harm:

Overriding safety features to allow the driver to sleep.

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 part time at Zoot and will continue to work there after graduation unless I receive a better job offer in the meantime.

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*
Sigma Alpha Epsilon	Countless
Co-ed Volleyball Intramural	2 hr/wk
Mens Volleyball Intramural	2 hr/wk

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

Activity Description	*Hours Spent (estimate)*
Mostly school projects because our only shared background was major choice	30 hr / semester

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:

VSCode integration for easy repo control

Non-trivial feature 2:

Most popular use, GitHub, has an amazing site.

Non-trivial feature 3:

Branch merging (there is VC that doesn't have this...)

Question 12: During your time at MSU, list any major non-classroom, non-paid activities that you engaged in to help prepare for your computer science career. For example, you might have taught yourself a programming language or attended a workshop on a CS topic. For each activity, **estimate** the number of hours spent.

Activity Description	*Hours Spent (estimate)*
Online MEAN Course	100
YouTube tutorials for various topics	Countless
Stack overflow and Google as a whole for help	Countless

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Name Alyse Mizel

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 hash map where VIP tickets with a 1 would be at the top & have the name attached to that ticket. You can sort by both name(value) & ticket (Key).

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

1	Joe
10	Kim
300	tom
5,000	Susan

Key Value

Find Tickets with urgency=1
Return Joe.
Find urgency with name=Susan
Susan is 5,000.

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

1	Joe
1	Susan
30	Tom
500	Kim

Key Value

Find Tickets with urgency=1 & name=Susan
Return Susan

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 int numofTimes(str word, str char);
    Str word = word;
    Str Char = Char;
    int howlong = word.length();
    int numtimes = 0.
for(int i=1; < howlong; ++);
    if( word[i] == Char)
        numtimes++;

Return "The Character" + Char + "appears in" +
word + "This many times" + numtimes;
```

these are pluses sorry.

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:

By adding each number at a time you would want your time to continue linearly. you wouldnt really expect it to be faster or slower then that.

Worst case time complexity of algorithm:

O(n^2)

Explanation of worst case time complexity:

If you are adding numbers one at a time you might run into the issue of the program slowing down if you are dealing with a massive amount of data, where it would start fast but get progressivly slower & slower.

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 an algorithm is biased towards something, a group or product for example, due to how the algorithm is programed.

b) Provide a hypothetical example of how algorithmic bias could manifest itself in college admissions software.
By not accepting black/women applicants as much as men. Because it had been trained in accepting men 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: Google

First possible impact:
More open source code. If more people could have access to code that would make their projects better then you would make more advancements.

Second possible impact:
Less lawsuits. Sometimes people make similar code to do similar things. If we create a precedent that a small subset isnt infringment, if being used for a bigger project, more work would be done.

Third possible impact:
Easier for startups. They can use that code so they arent crushed by bigger companies.

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 to self. If the car is faulty it would potentially hurt the driver by crashing or driving recklessly.

Second type of harm:
Harm to others. If a car cannot recognize other people in the road it could potentially put others at risk of harm.

Third type of harm:
Harm to property. If a car has faulty software and doesnt stop for objects, like traffic cones, it could cause property damage.

Question 8: Describe your one-year plan following graduation. If you plan to work, list where you have applied (the company and the position) and mention whether you have received any offers. If you plan to go to graduate school, list where you have applied (the school and the area of study) and mention whether you have received any acceptances.

I am planning on taking an internship before going to graduate school. I have applied to PNNL & USGS, I have also recieved more offers through LinkedIn. For graduate school I wish to get my masters in video game design at the University of Utah, I have not applied 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*
MSU RPG Adventuring Guild	A lot of time

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:

Being able to save your work. might sound basic but if you are working on important code & need a backup Github is important.

Non-trivial feature 2:

open source, you can share your code with others & see others code.

Non-trivial feature 3:

Work with a team. If you open many branches you can see what other people are working on & use each others code without stepping on their work

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)*
Blendr - 3D Animation	30 hrs

Best wishes wrapping up the semester and in the future!

Montana State University Computer Science Department

Graduating Senior Exam

Academic Year 2022-2023, 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 Payton Morris

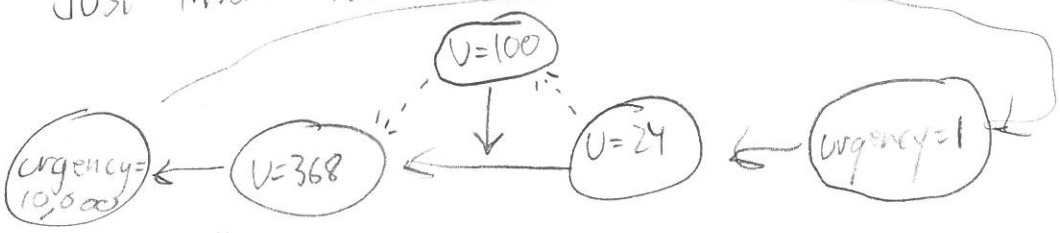
Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer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

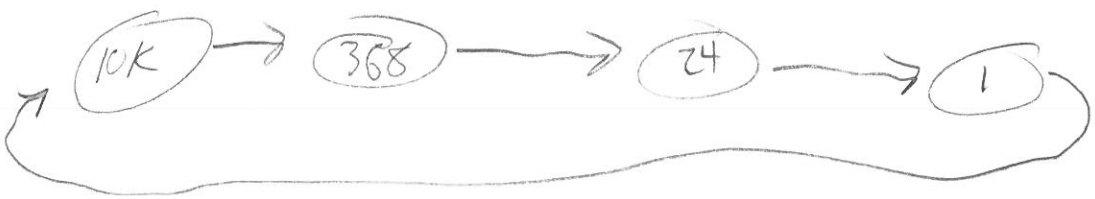
b) Describe one way in which this data structure could be implemented and draw a picture of that data structure.

Just insert ticket in list @ place where urgency fits



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

Just reverse the arrows



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 func(String, Char):
    int number = 0
    for x in String
        if x = char
            number++
    return number
```

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

Best case time complexity of algorithm:

N log K

Explanation of best case time complexity:

?

Worst case time complexity of algorithm:

N log N

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)*
Pi Kappa Alpha	Sports	1000+
UIT	support tech	50-200

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

Where an alg is bias toward a group of results

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

Turning down whites to improve diversity

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

Side you choose to win: Oracle

First possible impact:
big corps die, lose money, rewrite code

Second possible impact:
smb's can sell code to big boys

Third possible impact:
All code becomes copyrighted

Question 7: In the ACM Code of Ethics and Professional Conduct, one ethical principle stated is to ***avoid harm***. Describe three different types of harm that the software of an autonomous, self-driving car might cause.

First type of harm:
running people over

Second type of harm:
incorrectly reading traffic signs

Third type of harm:
car blows up

Question 8: Describe your one-year plan following graduation. If you plan to work, list where you have applied (the company and the position) and mention whether you have received any offers. If you plan to go to graduate school, list where you have applied (the school and the area of study) and mention whether you have received any acceptances.

- graduate
- travel to israel till june
- ~~Asst.~~ director @ summer camp till august 15th
- find software/tech job in seattle
- attend 10+ Mariners games

→ have and will apply to many. 1 interview and no offers yet, but sending 2-5 apps per day!

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*
Pi Kappa Alpha	1000+

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)*
Pi Kappa Alpha	1000+

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:

Commit

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)*
MSU UIT	150-200

Best wishes wrapping up the semester and in the future!

Thx XOXO

Montana State University Computer Science Department

Graduating Senior Exam

Academic Year 2022-2023, 80 minutes.

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Name Madie Munro

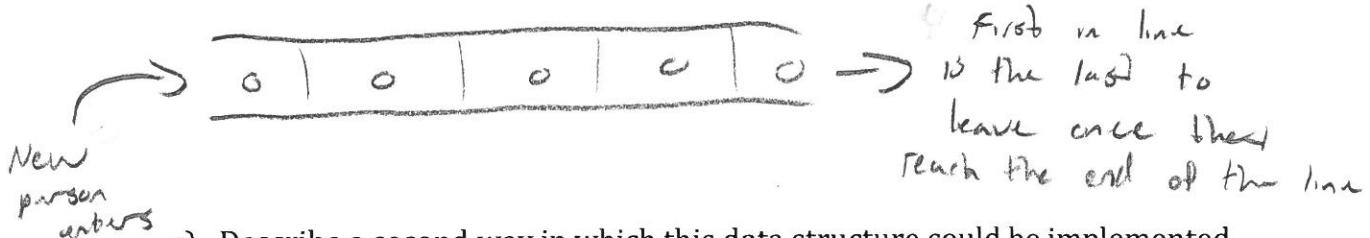
Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer 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 best because we want the score w/ highest priority to be sorted first in the queue and then dequeued after it has been addressed

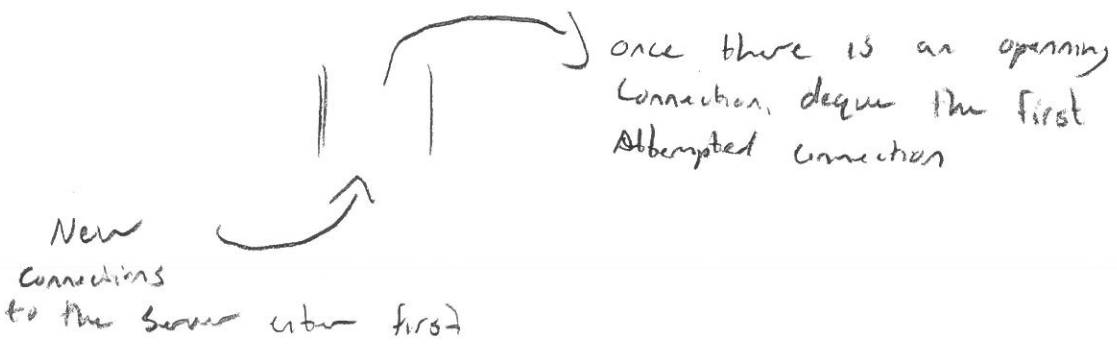
b) Describe one way in which this data structure could be implemented and draw a picture of that data structure.

A virtual waiting line:



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

Waiting period to connect to a server:



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 stringCount(String s, char c) {
    int count = 0;
    for(char ch : s) {
        if(ch == c){
            count++;
        }
    }
    return count;
}
```

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

Best case time complexity of algorithm:

O(n)

Explanation of best case time complexity:

The type of algorithm described works in linear time.

Worst case time complexity of algorithm:

O(n)

Explanation of worst case time complexity:

Same as above

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

Organization	*Main Activities*	*Hours Spent (estimate)*
University Band	Played the French Horn	200+
MSU Horn Ensemble	Same as above	15+
TA Helper	Assisted TA's during ESCI 102 lab	40+
Stemilt Growers LLC	Performed data analysis on fruit yields, managed data flows	400+

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

When an algorithm performs based on what info was provided

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

It could manifest by selecting students that fit the standard according to info it has (ex: Selects more male students than female)

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:

All code created is basically public domain / open access

Second possible impact:

More coding languages / software will use identical lines of code

Third possible impact:

You can't patent a language

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 distance from a car before stopping

Second type of harm:

Misidentification of driver / passenger / owner of the car

Third type of harm:

Could unknowingly record sensitive info / video / audio

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.

My one-year plan is to attend MSU for graduate school. I plan to do a master's in CS and to finish my non-thesis requirements. I have been accepted on an assistantship.

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 University Band	200+
MSU Horn Ensemble / studio	15+
MSU Intramural Volleyball	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)*
EGEN 310 class (worked on team w/ others)	45+
Bowling class	30+
Hosting Band sectionals	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:

Windows 10

Non-trivial feature 1:

Search bar

Non-trivial feature 2:

File system

Non-trivial feature 3:

Apps

Question 12: During your time at MSU, list any major non-classroom, non-paid activities that you engaged in to help prepare for your computer science career. For example, you might have taught yourself a programming language or attended a workshop on a CS topic. For each activity, **estimate** the number of hours spent.

Activity Description	*Hours Spent (estimate)*
Taught myself C#	4

Best wishes wrapping up the semester and in the future!