Montana State CS Graduating Senior Exam

Academic Year 2024-2025, 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 to provide a carefully reasoned answer to each question. This information will help us make improvements.

Name Ian Alford

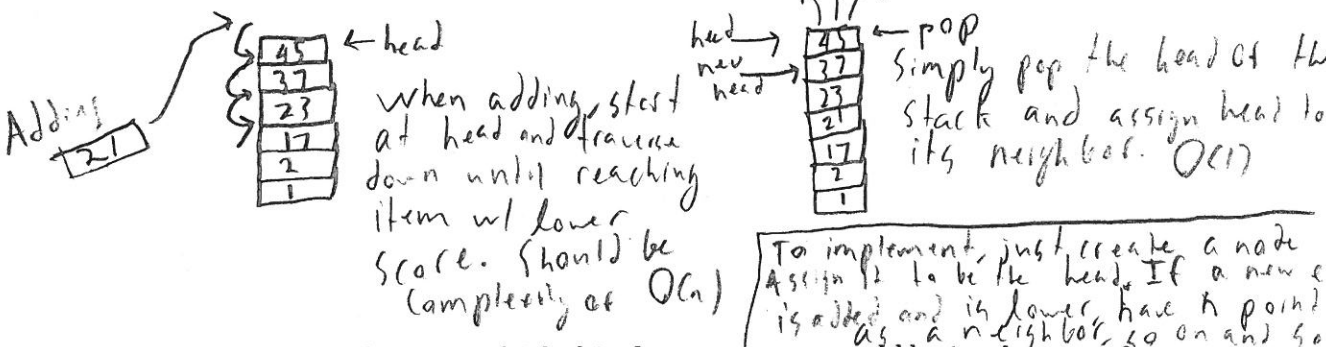
Major (Circle One): Computer Science B.A. or Computer Science B.S.

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

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

A sorted stack/stack that sorts on urgency when a ticket is implemented. Adding elements would be O(n) at worst to find a node less than the one being added, and the head would always be the highest score, so removing/removing it should only be O(1) always. Since this is dynamic, it doesn't have a fixed size.

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



To implement, just create a node n. Assign it to be the head. If a new element is added and is lower, have it point to it as a neighbor, so on and so forth. If a new node is greater than the head, make it the new head and have it point to the old head as a neighbor. This way the head is always the highest number and may be pointed to in O(1) time, and can have sorted elements added in O(n) time

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

single list



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

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

Your solution:

```
int countChar(char *string, char inpChar){
    int Caunt=0;
    while(*string){ // Since strings are null terminated
        if(*string==inpChar) countt++;
        string++; // add one to pointer address
    }
    return Count;
}
```

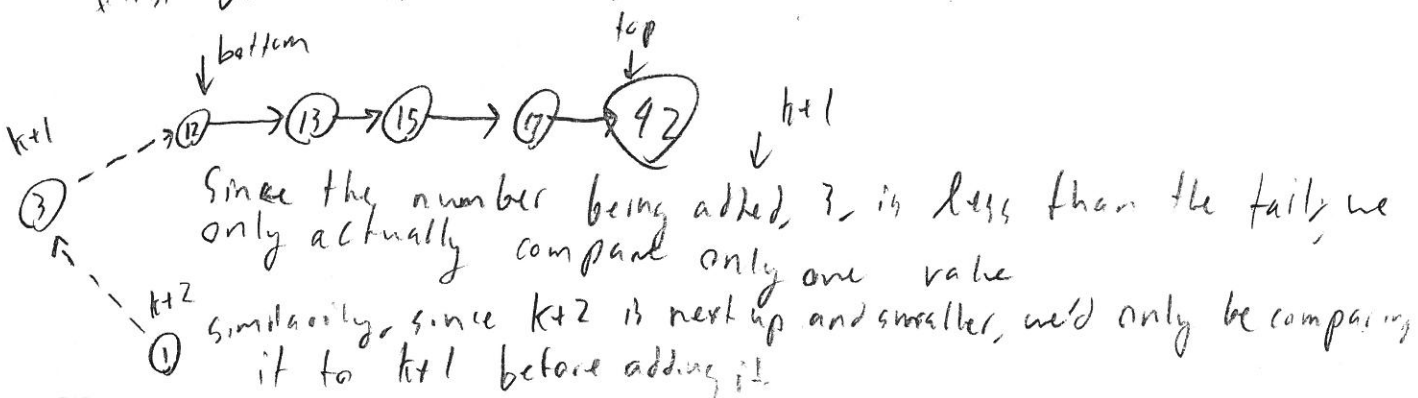
Question 3: Consider a singly linked list that contains **n** floating point numbers and is maintained in ascending order. An additional **k** floating point numbers will be added to the list, one at a time. You may assume that **k << n**.

Best case time complexity of algorithm:

O(1)

Explanation of best case time complexity:

If each number in k is subsequently lesser than the lowest value of the list, then it would only need to compare the first value of the list,

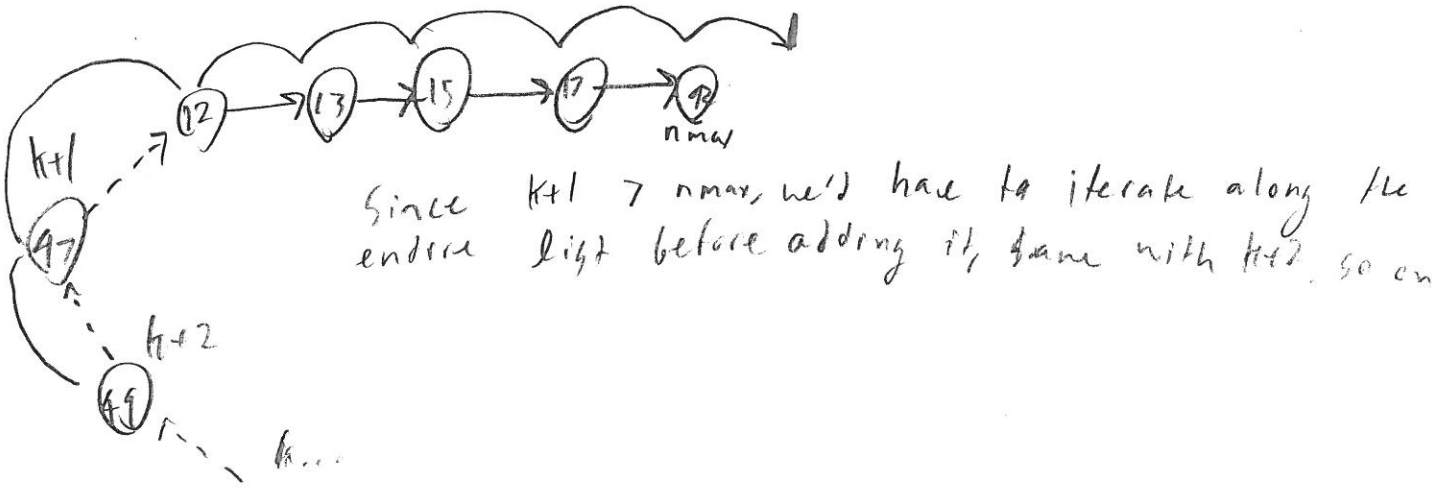


Worst case time complexity of algorithm:

O(n)

Explanation of worst case time complexity:

If each k value being added is subsequently higher than the head of the list, then we'd have to constantly compare the entire length of the list



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

Organization	*Main Activities*	*Hours Spent (estimate)*
MSGC	Microcontroller programming	~200?
Hoplite industries	Cyber security	~990 by May

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

Repeated/desired data not indicative of real-world truths over-represents itself in analysis and impacts outcomes

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

Only sampling Montana highschool students and setting admissions standards to the average graduate when students from other States may score higher/lower on tests due to different State standards/funding/etc, and assuming the Montana average is the national average

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:

Far more "borrowing" of code between companies/individuals

Second possible impact:

Open source further becoming the norm as it's harder to enforce copyright

Third possible impact:

More free software for reasons above

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:

Error out and cause physical harm to people.

Second type of harm:

Cameras/sensors may gather and sell data or may be hacked/causing privacy harm

Third type of harm: Increase reliance on cars and increase their price whilst further limiting public transit to the masses

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.

Find employment in embedded systems/microcontrollers

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

Organization Name	*Estimate Total Hours Spent*
Day drinking w/ friends	7500?

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

Activity Description	*Hours Spent (estimate)*
Multi Disc. eng egen 305? I forgot	A whole semester..
MSGC	see previous

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 / Git

Non-trivial feature 1:

remote access

Non-trivial feature 2:

branches

Non-trivial feature 3:

login tokens

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)*
Various robotic / microcontroller	7 90
projects	

Best wishes wrapping up the semester and in the future!



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Name Zachary Carmean

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

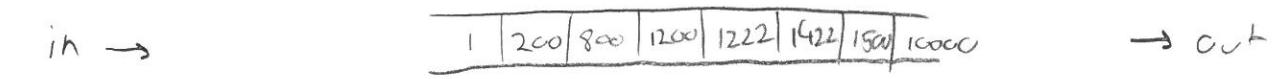
Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer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

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

A Priority queue would be the best data structure for this because it gives some items in the queue more presidence than others.

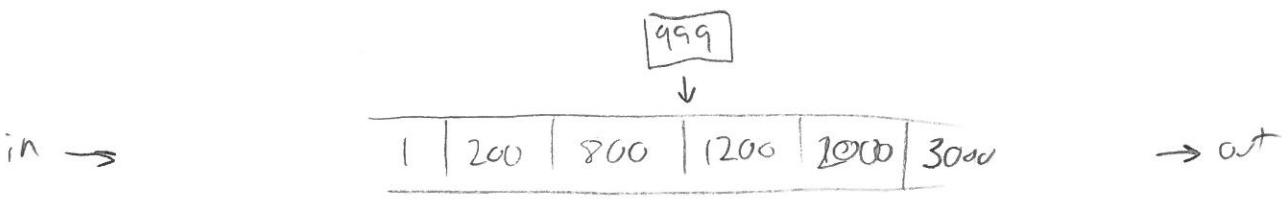
b) Describe one way in which this data structure could be implemented and draw a picture of that data structure.

One way to impliment this would be to give each ticket an urgency score then sort all of the tickets before Adding them into the queue.



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

Another way to impliment this data structure would be to search through the queue until to find the spot the ticket belongs to then insert it.



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 forExam(Str, Cha):
    Count = 0
    for Cha in Str:
        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:

Because the linked list is sorted we would just need to itterate thrugh the list until we find where k is inserted. The best case is the first spot within the linked list.

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

Explanation of worst case time complexity:

Our singly linked list is sorted so it will only iterate n times until we find where k is inserted.

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)*
Gallatin County Band	Concerts / rehersals	20 hours
Symphony Orchestra	Concerts / rehersals	100 + hours
Wind Symphony	Concerts / rehersals	100 + hours

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

algorithmic bias is when algorithms naturally favor one thing over another.

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

The algorithm could select students with specific qualities to them over other students such as in vs. out of state.

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: Googles mobile platform could suffer without the code from the JAVA API.

Second possible impact: Google may never use Oracle for their databases.

Third possible impact: Oracle may win a lot of money allowing them to further expand their systems.

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

First type of harm: it could go off course and hit another vehicle because the software doesn't recognize something

Second type of harm: It could accidentla sense something that isn't there and rapidly stop in the middle of the road.

Third type of harm: It could not sense something and accidentlly run into it.

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

I plan to go to graduate school at Montana State University and start that in spring semester of 2025. I have already submitted the application and am still waiting to see if I've been accepted. I will be doing the general CS Masters and also be getting the Masters Certificate in A.I.

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

Organization Name	*Estimate Total Hours Spent*
Symphony Orchestra	100+ hours
Wind Symphony	100+ hours
Woodwind quintet	100+ hours
Private Lessons	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)*
Resident Advisor	100 +
Symphony Orchestra	100 +
Wind Symphony	100 +
Woodwind Quintet	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: allows me to push my code for others to see

Non-trivial feature 2: allows others to add onto an existing project we may both be working on

Non-trivial feature 3: Can ensure privacy of code for if you don't want others to see.

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

Activity Description	*Hours Spent (estimate)*
LeetCode	70+ hours
Unity	20+ hours

Best wishes wrapping up the semester and in the future!

Thanks

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Name Jaya Cipe

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

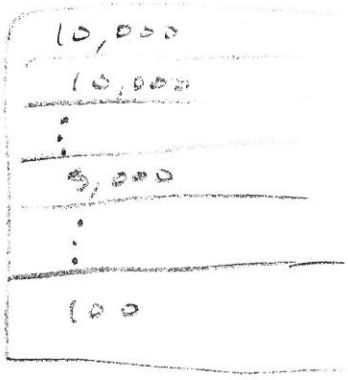
Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer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

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

Priority Queue

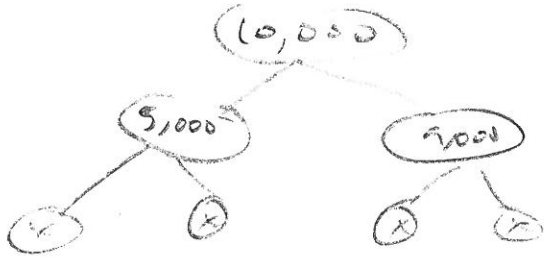
b) Describe one way in which this data structure could be implemented and draw a picture of that data structure.

Use java to create a priority queue where you can add items w/ higher urgency store to the top of the queue



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

Use a tree so that the highest urgency score is at the root of the tree and progress down



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 Char_count(string, char)
    return string.count(char)
```

To use:

```
String = "Hello World"
Char = "l"
char.count(string, char)
```

Returns: 3

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

Best case time complexity of algorithm: O(1)



Explanation of best case time complexity:

The k numbers are all greater than n numbers and are in ascending order. So k items are just added to the very end of the list



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

Explanation of worst case time complexity:

k values are shattered in between n values. So k values are inserted into the list in spots in between 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)*
Stats department	TA & grader	One full sem being TA over 100 hours grading two 2 years
Tennis Club	Playing tennis	did for a year probably 100 hours

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

I'm not sure about this. I think know there can be algorithmic bias in facial recognition for people with darker complection.

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

Maybe not selecting certain demographics for college admissions based on some sort of bias? I'm not sure on this question.

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:

Issues related to open source

Second possible impact:

AI risks if they are taking code or information from sources not their own.

Third possible impact:

Im not sure w/ this question I remember stuff in ethics.

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 risk of human lives. what if a human gets in front of an autonomous vehicle. will the car hit the person or save the life of the person in the vehicle.

Second type of harm:

legal trouble. who is to blame if an accident happens & who pays for it.

Third type of harm:

Take jobs of taxi drivers or people who drive semi-trucks or things like that

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 going to continue work at Show Imaging, a production company that is based out of San Diego, Nashville, and Orlando. I have good odds of moving up in that company to do software/production development. I have done with deployment of Under the Big Sky Festival.

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

Organization Name	*Estimate Total Hours Spent*
Tennis Club	Did for a year for about 2 hours a week
Intramural Soccer	maybe 10 hours?
Intramural Basketball	maybe 30 hours?
Intramural volleyball	maybe 10 hours?

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

Activity Description	*Hours Spent (estimate)*
Team Projects	Many hours
R this made me work professionally w/ others w/ different	
backgrounds than mine.	

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, its the only one I really know

Non-trivial feature 1: I'm not sure what nontrivial feature should mean...

Pull requests

Non-trivial feature 2:

Able to connect w/ IDEs for easier publishing instead of pure command line.

Non-trivial feature 3:

having a good website to see things clearly

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)*
Career fair	5+ hr
few networking events	5 hr

Best wishes wrapping up the semester and in the future!

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Name Joshua Elmore

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

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

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

a linked List

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

You search thru the list to find the ticket you need. and remove the eleme when it is completed



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

a data base where each ticket is a record and you have a is_deleted column to mark if a ticket is Done

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

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

Your solution:

```
Fun( count(char: c, string: s):
    ct=0
    For i in s
        iF(int(i)==int(s))
            ct++
    return ct
```

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 you are adding them all to the ends

Worst case time complexity of algorithm:

O(n·k)

Explanation of worst case time complexity:

if all of them are in the middle

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

Organization	*Main Activities*	*Hours Spent (estimate)*
Big sky robots	robotics/contract	1000
University IT	work	5000

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

i have never herd of IEEEP7003

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

racial profiling

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:
it dosent sound very import at it sounds like one company copyid anothers IP and they got sued

Second possible impact:
it could make open source

Third possible impact:
it could make oricle alot of money

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:
Pain and suffering to people in a crash

Second type of harm:
Property damage

Third type of harm:
geting people used to not paying atention to the road

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 got an offer from the university to be a full time system administrator

I am also apply in a wherever i can is software engeneriy

I also got an offer in washington at a robotis company

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

Organization Name	*Estimate Total Hours Spent*
Big sky robotics	1000
swim club	100

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

Activity Description	*Hours Spent (estimate)*
Wit (Job)	5000

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:

configuration with Jenkens CI/CD

Non-trivial feature 2:

unit tests with github/gitlab

Non-trivial feature 3:

maven repos in Java (Not git but github)

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)*
2 open sorce projects	100
Robot control systems	200

Best wishes wrapping up the semester and in the future!

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Name Morgan Hanson

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

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

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

A HashMap because you can pair customers with their info and sort by urgency scores.

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

Assign every customer to an urgency score and sort from highest to lowest

Customer 1 name : urgency
Customer 2 name : urgency

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

You could switch the 2 variables and add VIP status

urgency: customer 1 name : VIP
urgency : customer 2 name : regular

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:

```
function count(string word, char x){
    int count = 0;
    for (i in word){
        if (word[i] == x){
            count++;
        }
    }
    return count;
}
```

n → LinkedList<List>

k → list.add

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+k)

Explanation of best case time complexity:

Assuming k is unsorted, when adding each new number to the list, the list needs to iterate through every number in the list to make sure the new elements being added are sorted correctly.

Worst case time complexity of algorithm:

O(n·k)

Explanation of worst case time complexity:

Assuming k is sorted, we only need to iterate through the list once instead of every time which makes it the best case scenario.

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 track & field	Sprinter	1,000
WIE	attended meetings	10
Pi Beta Phi	Philanthropy events, meetings	200

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

When an algorithm prefers certain inputs over others.

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

If admissions software flags individuals with a certain race and puts them higher up on the list when otherwise candidates are the same.

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 code sharing would take place and people could learn from eachother

Second possible impact: With shared knowledge, technology would be able to advance faster as everyone has access to new tech.

Third possible impact: Individuals would be more able to change jobs as most companies would be using the same tech and procedures.

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:

If the car inaccuratley didnt detect an obstacle, it could cause a crash resulting in the physical harm of the person(s) inside.

Second type of harm:

If it were to hit an electrical pole, it could disrupt power for many.

Third type of harm:

If someone were to be able to hack the car, individuals exact whereabouts could be accessed which would affect their safety.

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 not recieved any offers but I have applied to numerous front-end engineering positions as well as Product management programs.

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

Organization Name	*Estimate Total Hours Spent*
MSU intramural sports	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)*
Being an athlete on track team	1,000
intramural sports member	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:

I do not know what a version control system is.

Non-trivial feature 1:

Non-trivial feature 2:

Non-trivial feature 3:

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

Activity Description	*Hours Spent (estimate)*
I took an online JS course	100

Best wishes wrapping up the semester and in the future!

Montana State CS Graduating Senior Exam

Academic Year 2024-2025, 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 to provide a carefully reasoned answer to each question. This information will help us make improvements.

Name Jack Hayward

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

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

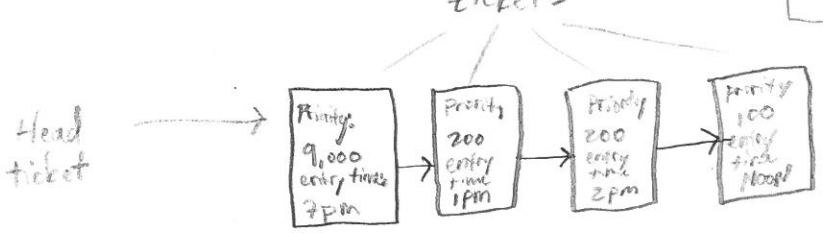
a) What simple data structure would best model this situation? Explain.

Priority queue. This structure uses the first in first out style order, and then sorts higher priority tickets to the front of the line. This structure will order tickets with the same priority by the order of arrival and place high priority in front of low priority.

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

priority = urgency score.
This might account for entry time as well as VIP status

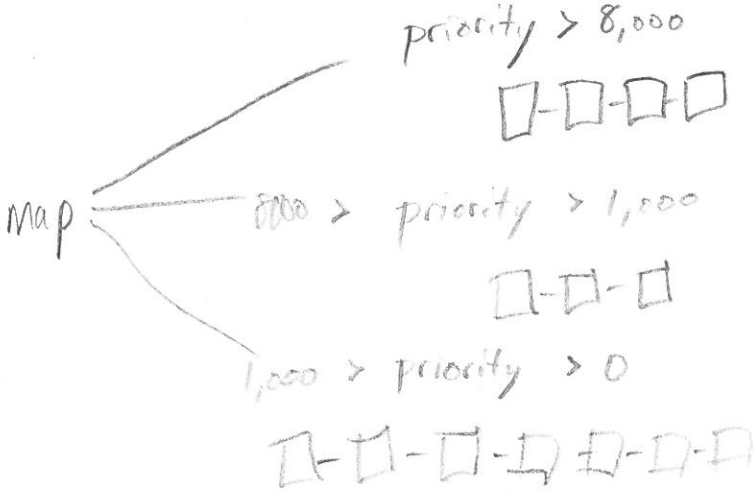
Linked List



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

Priority Map.

A map of separate queues where the key is the priority. The high priority queues are addressed before the low priority queues



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: in python

```
def charCounter(string, char):
    count = 0
    for letter in string.lower():
        if letter == 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 that for each new float $\in k$ is less than the first float in the list for every single entry, the addition only takes one execution.

There for considering this is the way k is added to the list, it will take k operations to add.

Worst case time complexity of algorithm:

$O(N^k + k!)$

Explanation of worst case time complexity:

The opposite case, where for each float $\in k$ is the greatest number in the list, for every addition, a total of (length of LL) operations will have to be performed to insert the float at the back of the linked list. I guess this is going to be more than $N \cdot K$. more like $\sum_{i=0}^{k} (n+i)$

I'm not too fast with the math here but I would estimate this is more like n^k?

$\sum_{i=0}^{k} (n+i) > n^k$

So maybe

$n^k + k!$?

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)*
MSU UCA (CSCI 107)	Lab Instruction, grading, office hours	140
MSU UCA (CSCI 127)	"	150
Data Annotation	evaluation of AI	80
	generated code and	
	code recommendations.	

paid position

This was a great learning tool. I basically had to research and fact check AI generated coding advice and rate its accuracy.

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

Bias introduced to data due to the methods used to manage the data.

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

Algorithmic Bias could be manifested in a college admissions software if the student's applications were stored in a binary tree sorted by their last name's first letter. If the user of the software decides to print out all of the students starting from the root node, students who are far leaves from the node won't be printed until the bottom of the list. (so students with last names starting with A or Z would have negative bias.

Another way could be sorting the Students based off of their household income. This would introduce bias against low income 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 companies begin to use code from this Java API knowing that they can win a similar lawsuit.

Second possible impact:

API's become public as there are no legal copyright protections from them

Third possible impact:

Company software is easier to reverse engineer given the knowledge of the 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:

well obviously, crashing the car, even if it is due to an unforseen benign error.

Second type of harm:

The car taking a long route or driving dangerously against the will of the driver. (passanger?)

Third type of harm:

The car refusing to drive to a certain location. This shouldn't be decided by the car. Say some state law prohibits self driving cars in the state of georgia, imagine the owner of the car lives only 2 miles outside of the Georgia border, and urgently needs to get to the nearest hospital, which is in georgia. The car refusing to enter Georgia causes harm.

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

I plan on getting an internship where I can use my knowledge of computer science along with my knowledge in GIS (my chosen Minor). Hopefully, this internship will lead to a career in GIS/GIS software development. I am currently working on redesigning the GUI for a low elevation wind mapping software for the US forest service on behalf of the university as my capstone project. I have applied to: OnX maps
Land ID
USGS
USDA Forest Service
BLM (Bureau of land Management).
given that I only submitted these applications last week, I have yet to recieve any offers

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

Organization Name	*Estimate Total Hours Spent*
MSU cycling Club	50
BSF (Bridger Ski foundation)	~ 10
Grey Dog Open Jam (improv. Music)	> 100

not affiliated with the university.

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)*
Many classes, especially gen-ed, that required a high level of collaboration.	≈100 its hard to say I've been in situations like this at MSU for years.

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

Name of most sophisticated version control system:

GIT / Github

Non-trivial feature 1:

Branch structure for pushing, commiting, and merging versions. This allows to see the progression of a software over different versions and is very helpful for tracing bugs.

Non-trivial feature 2:

Gant-charts to show a history of changes and contributions. This allows tracking for who did what work.

Non-trivial feature 3:

Project management ticketing system. This is an easy way to assign, track, and schedule work from within the version management system

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 "Talks" and conferences	3-4
on CS topics that were hosted	(I only went to a couple)
by MSU	

This section specifies "non-paid", but my experience doing remote contracting work evaluating AI generated code for the company Data Annotation was a fantastic learning tool. I would put it here but it was a paid contract so I appended it to another sheet.

Best wishes wrapping up the semester and in the future!

Thanks!

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Academic Year 2024-2025, 80 minutes.

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Name Jasmine Hruska

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

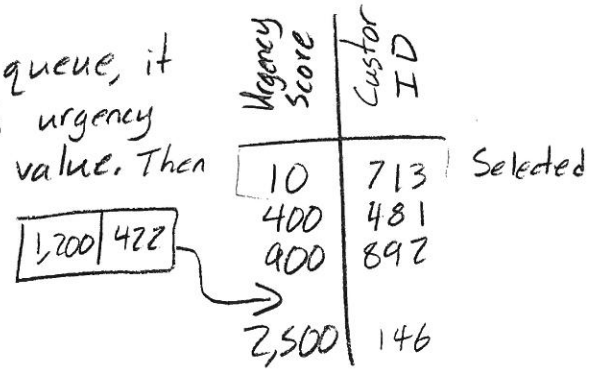
Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer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

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

Priority Queue, as the more urgent scores would be able to be selected first.

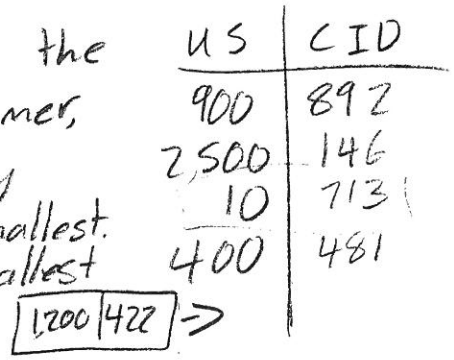
b) Describe one way in which this data structure could be implemented and draw a picture of that data structure.

When a custor enters the queue, it is placed in line based on it's urgency score. Placing it at in order by value. Then when a customer is selected, it is from the top of the quene. Selected item are removed.



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

New Items are added to the end. When selecting a customer, it iterates through all urgency scores, keeping track of the smallest. Once all are checked, the smallest score is selected and removed.



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

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

Your solution:

```
Int countChar(String s, Char c) {
    int count = 0;
    for(int i = 0; i < s.length; i++) {
        if(s.index(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:

$O(k)$

Explanation of best case time complexity:

For each k, it needs to find its spot to be inserted. This could be the first spot every time.

Worst case time complexity of algorithm:

$O(kn)$

Explanation of worst case time complexity:

For each k, it needs to find the spot it should be indexed to. This could be the last spot every time, requiring n items to be checked. This is for each 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)*
Montanans (choir)	rehearsing, concerts, leading sectionals	≈300
Voces Lumina (choir)	rehearsing, concerts	≈75
Youth Choir (Music in Montana)	demos, and teaching	≈12
MSGC	office aid	≈150
Borealis	research	≈600
American String Teachers Association	social media	≈10
REU	research	≈400

question 9

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

when a training set of data has a bias, so the resulting algorithm will as well.

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

An algorithm to process scholarship applications is based on prior data. If not many women have historically been chosen, then the algorithm could dismiss applications from women more.

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 access to code

Second possible impact:
More protections of created work

Third possible impact:
More lawsuits impacting things made before this decision

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 pedestrians from an accident

Second type of harm:
harm to driver from an accident

Third type of harm:
harm to property from an accident

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

I plan to work a Anasphere as a software developer. The company is based in Belgrade, and has a focus in aerospace engineering. This hardware is tested via high altitude balloons. I have accepted this offer.

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

Organization Name	*Estimate Total Hours Spent*
Montanans (choir)	≈300
Voces Lumins (choir)	≈75

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)*
Making a rover	≈40

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

Name of most sophisticated version control system:

I don't know what a control system is

Non-trivial feature 1:

Non-trivial feature 2:

Non-trivial feature 3:

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

Activity Description	*Hours Spent (estimate)*

Best wishes wrapping up the semester and in the future!

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Name James C Karinen

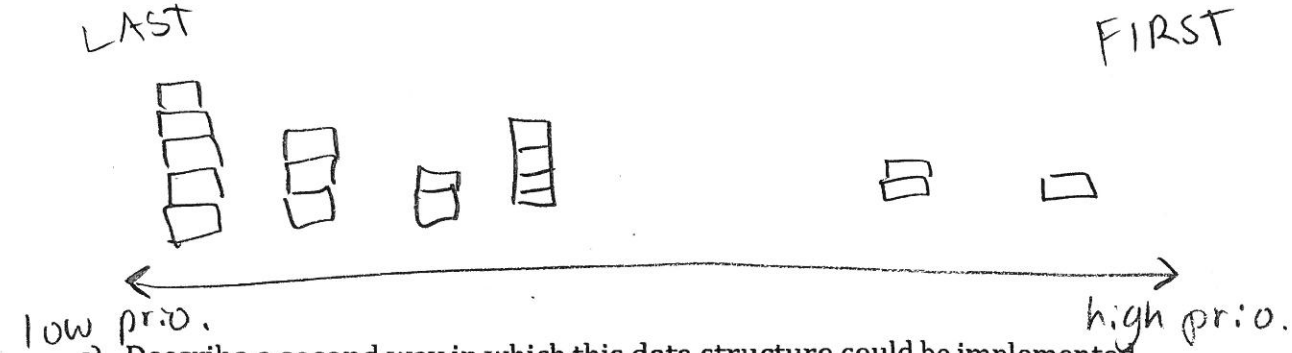
Major (Circle One): Computer Science B.A. or Computer Science B.S.

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

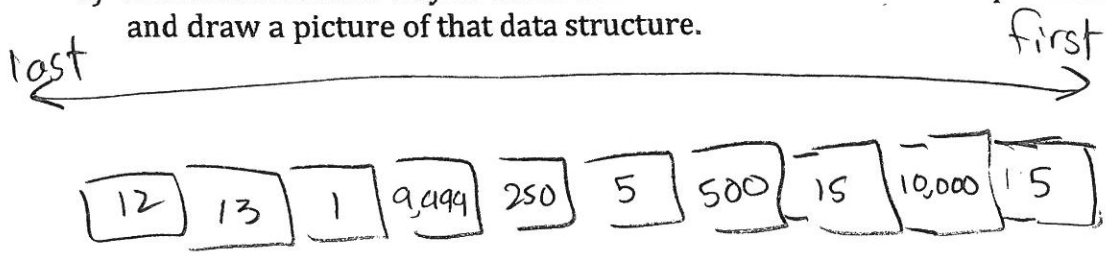
a) What simple data structure would best model this situation? Explain.

priority queue

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



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



* do highest priority rightmost first.

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): py

Your solution:

string

target letter

```
def letter_freq_in_string(s, target)
    freq = dict() # default 0
    for letter in s:
        freq[letter] += 1
    return freq[target]
```

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:

list is in ascending order already upon insertion

Worst case time complexity of algorithm: O(n)

Explanation of worst case time complexity:

inserted element needs to go all the way to the back of the list

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

Organization	*Main Activities*	*Hours Spent (estimate)*
AYCSS/CatTracks	Web development	>200

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

algorithm tends a certain way (not intended)

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

students unfairly favored based on immutable or irrelevant characteristics (not on merit, character, achievement)

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

Side you choose to win: Oracle

First possible impact:

Google pays a fine

Second possible impact:

they have to rewrite some code

Third possible impact:

their codebase improves because their developers no longer need to deal with Java.

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:

driver gets hurt

Second type of harm:

pedestrians get hurt

Third type of harm:

car company loses credibility (bad for economy)

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.

- spend a lot of time reading & writing about code and building stuff
- meet people, make connections, work together on stuff and see if any job opportunities come this way - cold-applying to jobs is a huge waste of life, would rather spend more time programming.
- have a backup plan in case writing code ceases to be a valuable skill in the future.

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

Organization Name	*Estimate Total Hours Spent*
Service Saturday	~10

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

Activity Description	*Hours Spent (estimate)*

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

Name of most sophisticated version control system: Git

Non-trivial feature 1: branches & merges –
work on branches then merge them to main...
or keep them separate!

Non-trivial feature 2: blame
see who wrote the awful code you're debugging
so they can never get away with it

Non-trivial feature 3:
detached HEAD
explore older versions of your application
and easily jump back when done.

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)*
writing code and building stuff	>200

Best wishes wrapping up the semester and in the future!

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Name Emily Ingbertsen

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

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

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

A maximum priority queue would be the best because it would automatically sort the queue & when you call pop() it will pop off the biggest.

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

you could implement this with a linked list by when you are inserting, you would evaluate if the one you are inserting is bigger than the one you are looking at &, if so insert before it. Then you can pop it off by removing the head of the linked list (keep track of it) & setting it to the next element



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

make bigger array ↘

You could also do this with an array but it would need to be recreated all the time when inserting. you could use a sort alg. to get the largest element &, just grab whatever head is or the first element

head = 0

↖ represents current head



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 myFunc(String str, char c){
    int count = 0;
    str = str.lowercase();
    char[] chars = str.split();
    for ch : chars {
        if(ch.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: O(k)

Explanation of best case time complexity:

In best case, the additional numbers being added onto the linked list would either be at the head of the list, thus we would only iterate K times because there's no need to iterate through the rest of the list.

Worst case time complexity of algorithm: O(n)

Explanation of worst case time complexity:

if the number was the biggest for example →

In worst case, we would need to iterate through the entire linked list to find the additional element's spot in the linked list. This would add on whatever point we've added to the list as well but since n is larger, it's O(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)*
AWC Association for Women in Computing	Vice President, supported women in CS, built community	1.5 hours/week (3 years)
Smarty Cats Tutor	Tutored CS students in lower div classes	2-3 hours/week (2 years)
Liberty Mutual Intern	Backend Software Engineering	40 hr/week 3 months
495 TA	TA-ed, gave advice, help to students	1 hour/week 1 semester

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

Algorithmic bias is where an algorithm may be skewed towards a certain group of things or persons usually because of a lack of consideration of those parties.

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

This could happen if an algorithm noticed that female students tend to stay in university longer & the algorithm wanted to maximize student retention so it would be bias towards accepting female 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: Oracle

First possible impact: would prevent companies & individuals from being able to claim authorship of other's code

Second possible impact: copyrights can be automatically established at time of writing code.

Third possible impact: would disallow others to use code they haven't written to be sold

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 &, injury to persons', life

Second type of harm: Bias in decision making of where to turn when avoiding collision. (could lead to people becoming harmed)

Third type of harm: Giving away personal information to insurance companies about driving habits

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

I have applied to many in-state & out of state companies like Workiva, PFL, Adobe, Geico, etc. I haven't heard from any of them (job market is terrible). Luckily I had an internship with Liberty Mutual & they offered me to return there in January. So I likely will be working there in Indianapolis for the next year & more.

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

Organization Name	*Estimate Total Hours Spent*
AWC	1 hour/week ← 3 years just being social

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

Activity Description	*Hours Spent (estimate)*
AWC	1 hr/week 3 years

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

Name of most sophisticated version control system: Git / Github

Non-trivial feature 1: collaborate with multiple programmers on a singular project.

Non-trivial feature 2: merge code with other code (having branches)

Non-trivial feature 3: roll back code when there are major errors in the 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)*
AWC	1 hr/week 3 years
Learning REACT.js on youtube	2 hour total

Best wishes wrapping up the semester and in the future!

Thanks! ♡

Montana State CS Graduating Senior Exam

Academic Year 2024-2025, 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 to provide a carefully reasoned answer to each question. This information will help us make improvements.

Name Ruby Martin

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

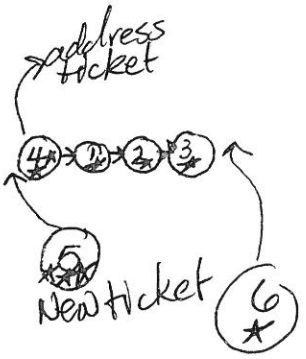
Question 1: A company uses a ticket system ~~for customer~~ service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's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

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

~~Priority Queue~~ Doubly linked list

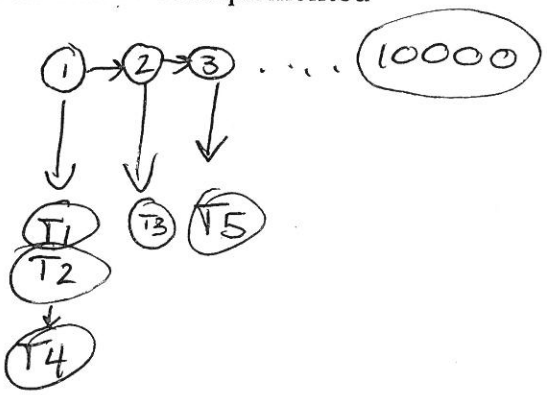
b) Describe one way in which this data structure could be implemented and draw a picture of that data structure.

Each node is a ticket with the first having highest priority. An incoming ticket has its priority checked, then is sorted accordingly, (timing of new tickets is considered second). There is only one data structure.



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

Each priority level has its own queue. Higher priority queues are addressed first when addressing the next ticket. The individual queues should be FIFO.



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~~ python

Your solution:

~~public int numChars (String string, Char c)~~

```
def numChars(String, c)
    count = 0
    for char in String
        if char = c
            count = count + 1
    return count
```

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

Best case time complexity of algorithm:

$O(k)$

Explanation of best case time complexity:

Best case is when the number is less than or equal to the first value as only one check must be made, and this occurs for ~~every~~ k numbers

Worst case time complexity of algorithm:

$O(n^k)$

Explanation of worst case time complexity:

If every number added must be added to the end (ie. greatest number) n comparisons must be made 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)*
MSU Chinese Culture Club	Officer → Social events planning	18 - 20
Undergraduate CA	grading, labs	60
Engineering Intern ↔	USFS ~~esteem~~	360+
SW Eng. Intern ↔	Wolfssl	480 - ~~530~~
ACM		3
Hacker Cats		4-6

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

Bias towards a particular outcome in an algorithm. ~~(bias)~~ (may be unintentional)

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

If the algorithm is trained on ~~misrepre~~ old data, current students may be misrepresented. (ex. favoring male ~~or female~~ students due to old data)

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

Side you choose to win: Oracle

First possible impact: code can be patented

Second possible impact: Companies can own code and use it for monetary gain.

Third possible impact: developers may unintentionally use copyrighted code and may be punished for 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: Collection of user data that may be obtained by outside entities.

Second type of harm: Misidentification of people vs animals or other items.

Third type of harm: loss of human autonomy, responsibility in cases of inevitable situations.

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.

Working full-time @ wolfSSL as a software Engineer
→ offer made + accepted.
May apply for part-time customer service work.

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

Organization Name	*Estimate Total Hours Spent*
MSU Chinese Culture club	15 - 20
ACM	3
Hacker Cats	4 - 6

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)*
Student worker, Rendezvous	100+

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

I'm not sure what this refers to, but if given different wording I might know

Name of most sophisticated version control system:

git

Non-trivial feature 1:

Squash/fixup ~ Alter revision history and commit message/hash

Non-trivial feature 2:

cherry-pick - add a specific commit to a branch

Non-trivial feature 3:

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

Activity Description	*Hours Spent (estimate)*

Best wishes wrapping up the semester and in the future!



Montana State CS Graduating Senior Exam

Academic Year 2024-2025, 80 minutes.

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Name Diego Meneyaz

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

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

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

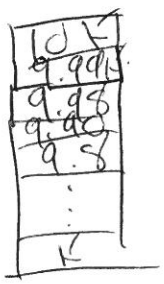
Max heap ~~of a priority~~ the higher score tickets would be found first, if it is all entered at once a Priority que would work too

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



you would create a simple graph in which nodes w/ a higher wait are pushed closer to the root (highest urgency)

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



create a que in which entries are added in accordance with score,
class ticket{ int : score }
Array[tickets] ← Populate
for{sort}

IDK how detailed, you get the idea.

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 LeetCode(String, Character
    int count=0
    for Char& in String:
        if (Char.==Character):
            Count++
    return count

Main():
    LeetCode(arg[0], arg[1])
```

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:

It doesn't say what we are searching for, However ~~Assuming~~ O(1) best case k is the highest

Explanation of best case time complexity:

Best case would be that k is the ~~lowest~~ highest number, and thus would stay in its location after checking ~~last~~ first node.

Worst case time complexity of algorithm:

O(n)

Explanation of worst case time complexity:

Unless the linked list has a "middle" node the algorithm would start at ~~last~~ first node then look at ~~n~~ n.next, ~~until~~ until it finds it's spot.

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 Esports	~~Beat~~ Video games	100
internship	IT	~~Uhh~~ 40.52
work	Make money to pay rent	too many

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

I don't remember IEEE, but usually algorithmic bias will favor an element that is more commonly used in said algo.

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

F. these kids → Legacy students, this group of students regardless of scores and other elements that give placement are sent to the top of the pile.

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: Monopoly on coding libraries

Second possible impact: Paying to use coding langs

Third possible impact: Increased use of internal 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: Hitting People.

Second type of harm: ~~Sca~~ Selling user data allowing for the tracking of drivers.

Third type of harm: They tend to be electric resulting in Lithium Battery Explosions

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 F-ed like 99% of CS Majors, thanks to AI

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

Organization Name	*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)*
NA	

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:

NA

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.

HAHA

Activity Description	*Hours Spent (estimate)*

Best wishes wrapping up the semester and in the future!

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Academic Year 2024-2025, 80 minutes.

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Name Annalise Pollock Foltz

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

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

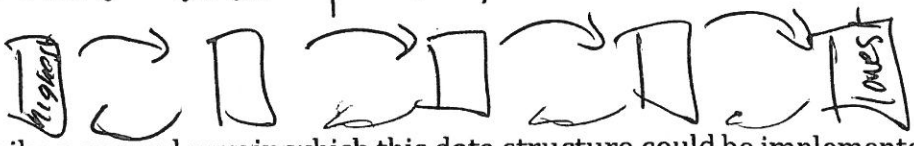
a) What simple data structure would best model this situation? Explain.

~~binary search, a binary tree allows you to sort and easily find the~~

a sorted linked list update ~~highest priority~~ is the easiest to and keep organized

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

create method for adding new priorities simply move through the list until you find where new values belong and update assignment to include new priority



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 with node classes and pointers for the next node.



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

Best case time complexity of algorithm:

$O(k)$

Explanation of best case time complexity:

the best case scenario is that all the numbers in k are smaller than those in n. not only that but the k values are sorted in descending order, so each new value can simply be added to the head of the list.

Worst case time complexity of algorithm:

$n(n+1)\ldots(n+k)$ $O(n \cdot k!)$

Explanation of worst case time complexity:

the worst case scenario is that for each new value you have to go through the entire list of values checking each one this means that each time you add a value that value will then have to be checked again

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

Best case time complexity of algorithm:

$O(k)$

Explanation of best case time complexity:

the best case scenario is that all the numbers in k are smaller than those in n. not only that but the k values are sorted in descending order, so each new value can simply be added to the head of the list.

Worst case time complexity of algorithm:

$O(n)(n+1)\ldots(n+k)$ $O(n \cdot k!)$

Explanation of worst case time complexity:

the worst case scenario is that for each new value you have to go through the entire list of values checking each one this means that each time you add a value that value will then have to be checked again

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)*
Campus Civil Rights	Advocating	300
Outpost	software engineering	240
hoplite	network analysis	200
code girls united	instructing	20

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

algorithmic bias is when algorithms lean toward certain outcomes

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

if an algorithm puts more emphasis on test scores it could be biased

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:

People get paid more for code

Second possible impact:

open source software becomes less common

Third possible impact:

ndas become more common

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 - crashes

Second type of harm:

intellectual - less learning / people who know how to drive

Third type of harm:

Socio economic - only rich people own them - driving more dangerous for poor

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

Work at hoplite for another year in Bozeman.

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

Organization Name	*Estimate Total Hours Spent*
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)*
Campus Civil Rights	300

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

Name of most sophisticated version control system: GitHub

Non-trivial feature 1: Swap merging

Non-trivial feature 2: rebasing

Non-trivial feature 3: ~~[illegible]~~ Authentication tokens

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

Activity Description	*Hours Spent (estimate)*
NA	

Best wishes wrapping up the semester and in the future!

Montana State CS Graduating Senior Exam

Academic Year 2024-2025, 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 to provide a carefully reasoned answer to each question. This information will help us make improvements.

Name Kyler Smith

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

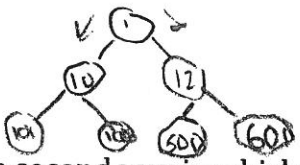
Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer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

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

Heap sort

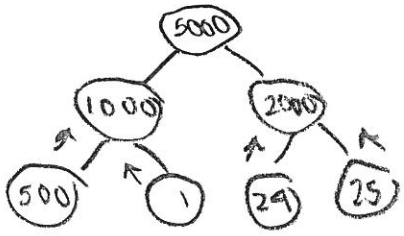
b) Describe one way in which this data structure could be implemented and draw a picture of that data structure.

Use the heap sort (priority queue) to compare urgency scores, & find the most urgent ticket.



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

Use heap sort to search for least urgent tickets, & sort as so.



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 numOfChars (string, char)
  int count
  do
    for char in string
        if string.contains(char)
            count++
while (string.ends() ) <- forgot method name

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 fast we can search through ascending is O(n), considering we are using a singly linked list.

Worst case time complexity of algorithm:

O(n log n)

Explanation of worst case time complexity:

could take longer to check every floating point #.

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

Organization	*Main Activities*	*Hours Spent (estimate)*
Intramural Sports	soccer, Basketball, volleyball	100 +
Work on campus (food)	sushi prep, cashier	100 +
fieldwork for intro classes	TA	36

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

How an algorithm looks and searches for certain characteristics.

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

looks for students who did certain clubs / extracurriculars

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:

New precedent for taking code from API's

Second possible impact:

Harder for smaller companies to innovate (new ideas)

Third possible impact:

monopoly on code (Oracle having a patent on things like JAVA 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:

Automated cars on human collisions

Second type of harm:

Property damage due to self driving cars

Third type of harm:

impairment to passengers in said car, eyes off the road or not paying attention.

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 working for the DNRC as a wildland firefighter (4th year) till I am layed off. I have been applying to companies (EPIC, Workiva) but have not been offered a job. My plan is to apply throughout the summer & look in Helena for positions in web dev. & software dev.

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

Organization Name	*Estimate Total Hours Spent*
MSU Intramural sports	100 +

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

Big UPS Sam!

Activity Description	*Hours Spent (estimate)*
EGEN 310 coder	60-80
Robot for embedded systems	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: Intelij

Non-trivial feature 1:

auto - complete

Non-trivial feature 2:

Ai helper

Non-trivial feature 3:

code generation (compiler)

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)*
CS workshop in JOB	2
taught myself CSS, Javascript, ect.	30

Best wishes wrapping up the semester and in the future! :)

Montana State CS Graduating Senior Exam

Academic Year 2024-2025, 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 to provide a carefully reasoned answer to each question. This information will help us make improvements.

Name Megan Steinmasel

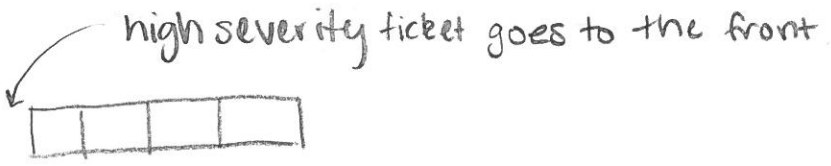
Major (Circle One): Computer Science B.A. or Computer Science B.S.

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

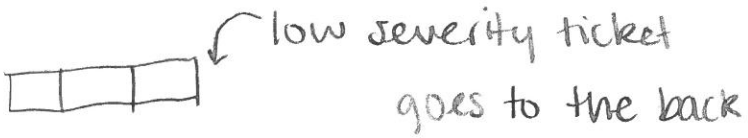
a) What simple data structure would best model this situation? Explain.

queue

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



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



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

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

Your solution:

```
def funct(str, chr):
    for(i in str):
        if chr == i:
            print("found character {chr} in string")
```

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:

→ time complexity, at best will be the amount of floating point numbers maintained in the list

Worst case time complexity of algorithm:

$O(n \cdot k)$

Explanation of worst case time complexity:

→ time complexity, at best will be n.k?

(I have not used time complexity in a long time and it was always hard for me to understand)

↳ might be beneficial to touch on this topic more in classes!

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)*
SECL Research Assistant	Research Snort, wireshark, and Docker	Worked here a year
AWC	Grace Hopper Meetings:	Not sure
Billings Clinic cybersecurity intern	data analysis on cyber alerts	July - Present
	lots of writing queries against databases which CSCI 440 prepared me well for!	

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

Bias data used to train an algorithim?

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

Could manifest if an algorithim only experiences specific data - not a range of data; the model becomes 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

First possible impact:

Using resources (but citing sources) like well-written code makes it so we all can benefit from technological advances.

Second possible impact:

Companies could produce code/products quickly and efficiently.

Third possible impact:

Advances in cybersecurity!

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 if software malfunctions

Second type of harm:

Mental harm?

Third type of harm:

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

Currently working an internship that ends a month after graduation. I am hoping to get an offer from this company to work remote and move to a state that is warm ☺

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

Organization Name	*Estimate Total Hours Spent*
Co-ed Soccer at MSU	One fall season

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)*
Grace Hopper	1 week

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

Name of most sophisticated version control system:

Github

Non-trivial feature 1:

can view previous versions of a file
(not sure if this is non-trivial but its nice)

Non-trivial feature 2:

allows access to open-source code

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)*
N/A	

Best wishes wrapping up the semester and in the future!

Montana State CS Graduating Senior Exam

Academic Year 2024-2025, 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 to provide a carefully reasoned answer to each question. This information will help us make improvements.

Name Kyle Zoellner

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

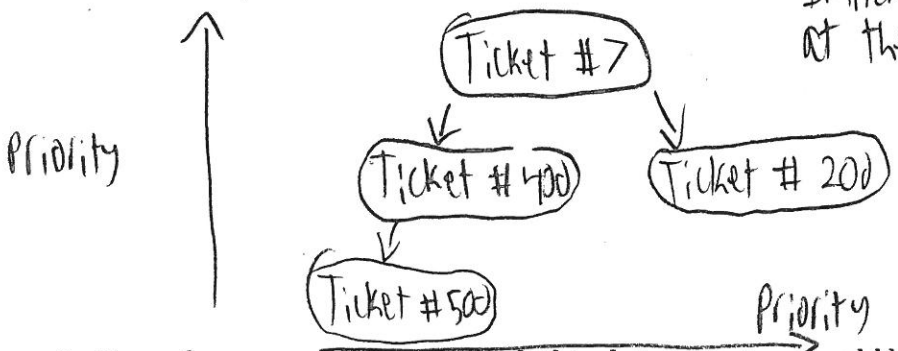
Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer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

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

BST; work downwards

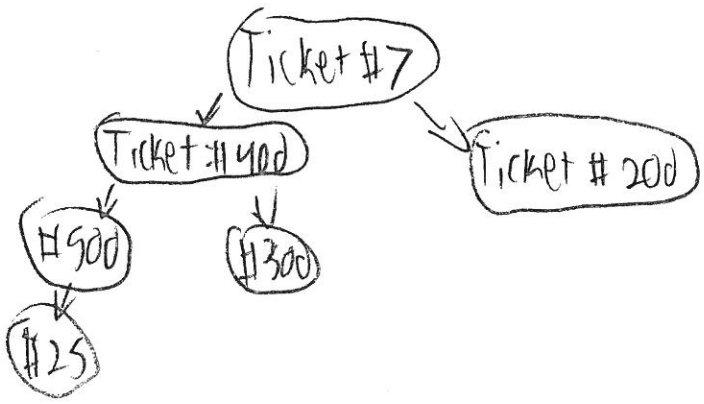
b) Describe one way in which this data structure could be implemented and draw a picture of that data structure.

Implement with high priority nodes at the top



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

Implement with high priority nodes working to the right:



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_fun(char, string)
    count = 0
    for i in string:
        if char==string[i]
            count ++

    return count
```

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

Best case time complexity of algorithm:

O(1)

Explanation of best case time complexity:

Each number is larger than the last, and can get added to the end.

Worst case time complexity of algorithm:

O(log(n))

Explanation of worst case time complexity:

The numbers are added randomly and the linked list must be sorted through and modified each time.

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

Organization	*Main Activities*	*Hours Spent (estimate)*
Bridger Solar Team	Web Developer	50
ResMed	Associate Software Developer	250
Coaching Freshmen Football	Coaching	140

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

When an algorithm favors a variable over another.

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

Candidates with accents in their names not getting processed correctly.

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

Side you choose to win: Google

First possible impact:

API code is free game.

Second possible impact:

Laws on copying certain types of code are loosened

Third possible impact:

Other companies start copying more API code.

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

First type of harm:

Hitting a pedestrian

Second type of harm:

Crashing and hurting those in the car

Third type of harm:

Crashing into property and damaging that.

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.

Full-time
ResMed is in the process of hiring me. I will move back to San Diego, live with my parents/work for a few months (while coaching Freshmen football), then move out with my brother.

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

Organization Name	*Estimate Total Hours Spent*
Oaks International	50
Church	25

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

Activity Description	*Hours Spent (estimate)*
Group work	20
Club work	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:

GitHub

Non-trivial feature 1:

Pushing/pulling in the command line

Non-trivial feature 2:

Stashing/unstashing code

Non-trivial feature 3:

Creating/checking out branches.

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

Activity Description	*Hours Spent (estimate)*
Some Web Dev Stuff	15
Using Game Dev Software	10

Best wishes wrapping up the semester and in the future!

