Montana State University Computer Science Department

Graduating Senior Exam

Academic Year 2022-2023, 80 minutes.

Your performance helps us assess how well we are meeting our stated learning outcomes for computer science majors. To pass this exam, spend at least 45 minutes in order to provide a carefully reasoned answer to each question. This information will help us make improvements.

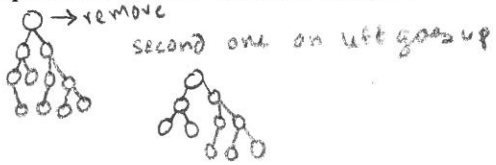
Name Isabel Nelson

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

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

a tree structure
↳ having most important on top ? least important on bottom. when top has been addressed, remove it and move the other ones up

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.

a red black tree



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

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

Your solution:

```
charOccur(str,char):
    count=0
    for(char in string){
        count ++ }
    return count
```

I would like to preface this test by saying that I really don't enjoy coding and I don't plan on doing any after graduation. I relied heavily on tutors to get me through classes and struggled a lot w/ understanding course materials. I did a dual enrollment program in high school and came in w/ 60 credits which didn't allow me to explore other areas. I picked CS and was in too deep early on, my not so great test answers are not because of the curriculum, but because I just have always had a hard time w/ code I don't regret majoring in CS though and have learned a lot! (↳ I also haven't done a lot w/ actual coding in almost a year.

· I also stared college the fall of 2020 during the pandemic which made it hard to be really active in things.

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

Best case time complexity of algorithm:

n^{n-1}

Explanation of best case time complexity:

n^{n-1} I think is the best time complexity there can be. I honestly don't remember

Worst case time complexity of algorithm:

no

Explanation of worst case time complexity:

I think n^0 is the worst case time complexity in any algorithm.

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)*
RCCM - resurrection catholic campus ministries	reading @ church, group activities, retreats, church	150 ish ?
WIE - women in Engineering	wie dinner, some of the activities (wasn't that involved)	10
AWC	went to a couple meetings	5
American Tower Corporation (innovation analyst)	summer internship, research & built business case on wind energy	500

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

I do not remember learning this at all, but if I guessed I would say the algorithm has a bias to choose or select a specific thing or item.

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

The algorithm could select or pick out specific applications w/ certain attributes the college is looking for like gender, gpa, race, extracurriculars, etc

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

Side you choose to win: Oracle

First possible impact:

companies will be very reluctant to copy others' code

Second possible impact:

companies will be sure to seek permission before copying code

Third possible impact:

companies will be less likely to take others' code

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

First type of harm:

- Could steer in the wrong direction or wrong way causing harm to the driver if it goes into oncoming traffic or off a cliff

Second type of harm:

- Could not stop when it's supposed to injuring a passenger in the car or someone outside of the car if they get hit

Third type of harm:

- Could fail to switch back to a manual or human driver in case of emergency causing harm towards others

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

After graduation I am moving back to my parents house in Minnesota and am taking the summer off. I am an extremely burnt out student and need a break. I have started apply for various entry-level product management roles. I'm not very picky about where I work or what I do for a job. I'm open to different possibilities and don't want to rule anything out. I do not want to code after graduation. I don't like it.

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

Organization Name	*Estimate Total Hours Spent*
Resurrection Parish	150!

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

Activity Description	*Hours Spent (estimate)*
RCCM	150?
American Tower Corporation (internship)	500

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

Name of most sophisticated version control system:

I honestly don't know what this means.

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)*
n/A	
I quickly learned that I didn't enjoy coding. I was in too deep to change majors. I never really did anything on my own time besides played w/ html & css now and then.	

• I kind of feel like BIA students need to be required to take more coding classes. I only took 107-232 and sometimes felt behind or lost compared to other students. I wish I would have taken more. I don't regret doing BIA and getting a minor in Business though.

Best wishes wrapping up the semester and in the future!

Montana State University Computer Science Department

Graduating Senior Exam

Academic Year 2022-2023, 80 minutes.

Your performance helps us assess how well we are meeting our stated learning outcomes for computer science majors. To pass this exam, spend at least 45 minutes in order to provide a carefully reasoned answer to each question. This information will help us make improvements.

Name Cole Orelup

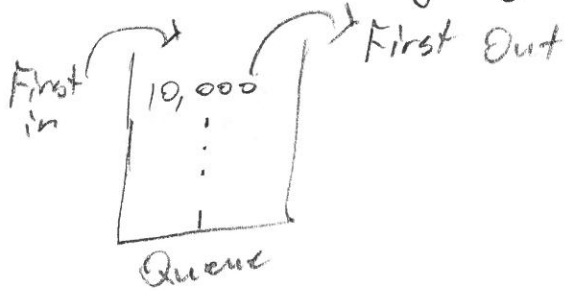
Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer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

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

A queue that compares urgency score.



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

?

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

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

Your solution:

```
def charOccurance(str, char):
    occurances = 0

    for ch in str:
        if ch == char:
            occurances += 1

    return occurances
```

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:

Adding nodes to a singly linked list happens in O(1) time.

Worst case time complexity of algorithm:

O(n)

Explanation of worst case time complexity:

Iterating through a singly linked list happens in O(n) 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)*
MSU Wind Symphony	Playing trumpet	?
Spirit of the West	Playing trumpet	?

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

Bias as a result of code written by a developer.

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

Only certain races get admitted due to how the algorithm was coded

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:

More lawsuits against big tech for copying code.

Second possible impact:

Big tech more careful

Third possible impact:

Big tech fights back with lawsuits against smaller companies.

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

First type of harm:

Endangering the driver

Second type of harm:

Endangering pedestrians

Third type of harm:

Endangering emergency vehicles

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.

Get a job somewhere. Have no idea where or what I want to do.

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

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)*
Spirit of the West	?
MSU Wind Symphony	?
EGEN 310R	?

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

Name of most sophisticated version control system: Git

Non-trivial feature 1:

Merge protection

Non-trivial feature 2:

Commit history

Non-trivial feature 3:

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)*
Self - taught industry tools	?

Best wishes wrapping up the semester and in the future!

Montana State University Computer Science Department

Graduating Senior Exam

Academic Year 2022-2023, 80 minutes.

Your performance helps us assess how well we are meeting our stated learning outcomes for computer science majors. To pass this exam, spend at least 45 minutes in order to provide a carefully reasoned answer to each question. This information will help us make improvements.

Name Ryley Ourada

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 dictionary. key-value pairs of customers and their urgency score.

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

By assigning each customer as a key they would be unique and could easily be added to the dictionary

John : 300
Tim : 9000
Sarah : 2700

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

You could have each urgency score be a key and all values for the key are stored together

10000 : Nathan
9999 : Anthony, kaya
...
2 :
1 : Drew

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 countString(string, character):
    count = 0
    for i in string:
        if i == character:
            count += 1
    return count
```

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

Best case time complexity of algorithm:

O(n)

Explanation of best case time complexity:

Best case you find that your k values are all ordered at the end so your complexity is from checking n values before you get to k values.

Worst case time complexity of algorithm:

O(n)

Explanation of worst case time complexity:

Worst case you find that you k values are all ordered at the front of the list meaning you have to shift all of the pointers as well as look at all of the n values which is 2n or 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)*
None		

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

Having some part of a program do something unfair to a group of people due to how it was programmed

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

If your program threw out any submissions that had characters in the name not apart of the english accent which would be heavily biased against foreigners and even just those with foreign names as Léonore, Weiß, or X Æ A-12

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: Java API

First possible impact: It shows that big companies can still actually get in trouble rather than being able to sweep it under the rug

Second possible impact: Both companies would get backlash as Google steals and Oracle is strict on those using their code.

Third possible impact: it shows that the courts respect code as intellectual property and not just something anyone can use.

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

First type of harm: Physical harm to passengers or pedestrians if not properly coded

Second type of harm: Economical harm if those who drive trucks or buses or cars professionally lose their jobs.

Third type of harm: Security harm if the program uses data of where the car has been to sell to companies.

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 hoping to work at Zoot in four Corners.

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

Organization Name	*Estimate Total Hours Spent*
MSU RPG Adventuring Guild	120

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

Activity Description	*Hours Spent (estimate)*
EGEN-310	45

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 multiple people to work on the same file.

Non-trivial feature 2:

Can transfer files between locations to work on it on different devices

Non-trivial feature 3:

Can have backups

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	1

Best wishes wrapping up the semester and in the future!

Montana State University Computer Science Department

Graduating Senior Exam

Academic Year 2022-2023, 80 minutes.

Your performance helps us assess how well we are meeting our stated learning outcomes for computer science majors. To pass this exam, spend at least 45 minutes in order to provide a carefully reasoned answer to each question. This information will help us make improvements.

Name Abigail Quinn

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

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

Tree, most VIP at top

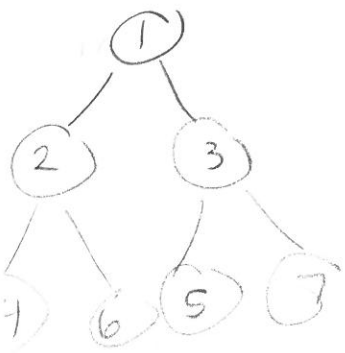
b) Describe one way in which this data structure could be implemented and draw a picture of that data structure.



insert all the tickets, remove the most urgent, the root, tree will fix itself to move all nodes where they goo

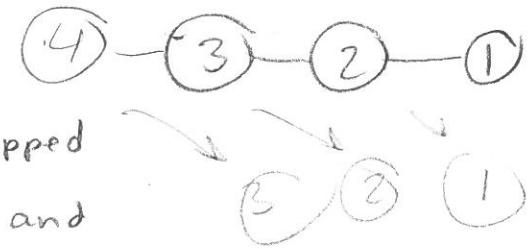
nodes are unique numbers

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



linked list

When 1 is popped 2 becomes 1 and so on,



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 fun(String S, Char C){
    int Count = 0;
    for(char X in S){
        if X.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:

$O(n)$

Explanation of best case time complexity:

if there is only 1 K the algorithm only has to go through all the ns to know where to put it

Worst case time complexity of algorithm:

$O(n^{n-1})$

Explanation of worst case time complexity:

even if K is less than n it could be only one less

making the algorithm go through the n's every 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)*
AWC ?	Crochet at Steep Mt	4
	Went on a walk	2
Fork and Spoon	Volunteer	3

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

When the data set an algorithm used is not broad enough and leaves out important data making results false or untrue

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

Prefer males over females

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: if google won it would make stealing code not as bad as it is

Second possible impact: it would make referencing code more important

Third possible impact: it makes code yours, copywritten code, you could make money if someone wants to use 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: it could physically hurt someone if it malfunctions

Second type of harm: Creating the algorithm it has to choose between 2 evils like run over this person or this person the one chosen to get run over would be emotionally hurt

Third type of harm: hurt jobs that are driving. jobs people would lose their jobs

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.

right after school i'm going on vacation and want to have some what of a summer vacation. I do not have a job lined up I wish school didnt make me feel bad for this. I want to work on my computer science skills and figure out what I like and what I'm good at. I'll apply to jobs and hopefully get one. I am willing to go where ever it takes me and I am fine with going with the flow.

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

Organization Name	*Estimate Total Hours Spent*
res hall floor hockey	4

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

Activity Description	*Hours Spent (estimate)*

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

Name of most sophisticated version control system: git hub

Non-trivial feature 1: visual UI

Non-trivial feature 2: clear buttons and comments

Non-trivial feature 3: easy to pull to local machine

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

Activity Description	*Hours Spent (estimate)*

Best wishes wrapping up the semester and in the future!

Montana State University Computer Science Department

Graduating Senior Exam

Academic Year 2022-2023, 80 minutes.

Your performance helps us assess how well we are meeting our stated learning outcomes for computer science majors. To pass this exam, spend at least 45 minutes in order to provide a carefully reasoned answer to each question. This information will help us make improvements.

Name Mason Reyher

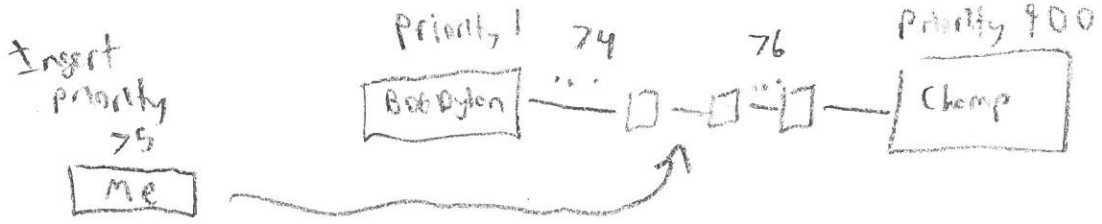
Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer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

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

A priority queue would work - so people who pay more can cut in line!

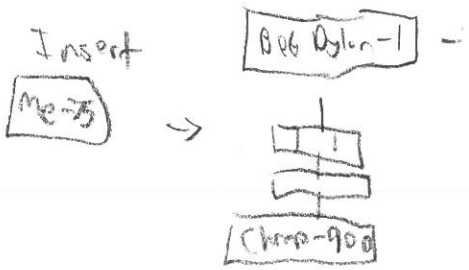
b) Describe one way in which this data structure could be implemented and draw a picture of that data structure.

Linked list ordered by urgency score



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

Hash map of ticket holders - primary key made up of customer name & priority



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

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

Your solution:

```
def fun(s, c):
    sum = 0
    for x in s:
        if x == c:
            sum += 1
    return sum
```

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: what does this mean?!

O(1)

Explanation of best case time complexity:

if $k < \min(n)$, then it will be the first put into the list. You only need to check the first value since it's maintained as ascending.

Worst case time complexity of algorithm:

O(n)

Explanation of worst case time complexity:

you have to iterate through the whole list, because $k > \max(n)$. Iterating n times to insert k at the n+1 th slot.

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

Organization	*Main Activities*	*Hours Spent (estimate)*
TechLink Intern	Sysadmin, Security engineer	≃ 400 hours
UCA, CSCI 127	Teaching Labs	160 hours
AWS Cloud Consultant Intern	Built ML Ops pipeline	480 hours
Data Engineer, Precocity LLC	Ingest datasets & build/grow data warehouse	≃ 600 hours

- 10-15 a week for 9 months

25 hours a week

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

Some silly psychology thing? I've never heard of it.

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

I assume taking gender or race into account for admissions can result in bias. Admissions should be based solely on merit, not some purple dragon - diversity quota.

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: Nobody allowed to use Java unless you pay for it!

↓

Second possible impact: Nobody uses Java because everything is open-source... Hmm... maybe that's why Python & Go are industry standards now...

↓

Third possible impact: Google invents Golang because Java is a badly designed language — Oracle goes bankrupt.

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

First type of harm: 'You have to either run into a family of 6, or swerve and crash into an orphanage. Choose, car!'

Second type of harm: 99% reliable software at the global level will fail, all the time. Mcdonald's employees are still present to help the ordering robot. Autonomous cars are negligent.

Third type of harm: putting computers in cars has led to computers shutting down & locking vehicles for various reasons — covid, climate stuff, polar bloak, If I buy a vehicle it's mine. Computers have too much power.

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.

May 12- graduation

May 18- I get married

May 30- start full time work at Precarity, LLC & move to Great Falls, MT.
(Remote work.

I also recieved offers from pH Data, and Raytheon, but did not accept. Also I haven't applied anywhere.

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

Organization Name	*Estimate Total Hours Spent*
Grace Bible Church	1500+

I've always gotten along with people. I don't understand the question.

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! Can I count Azure DevOps? Let's go with that.

Non-trivial feature 1:

CI/CD pipeline integration with GCP

Non-trivial feature 2:

Built in secrets manager useful for things like Terraform variables

Non-trivial feature 3:

Integration with Microsoft products (more of a bug, not a feature. Microsoft is bad at building tools. Not many 'Azure Engineer' positions out these days, are there

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

Activity Description	*Hours Spent (estimate)*
CompTIA Security+	50
Cisco Certified Network Associate	45
AWS Cert. Cloud Practitioner	20
Aws Cert. Solutions Architect, Assoc.	60
Aws Cert. Security Specialty	10
Aws Cert. Data Analytics Specialty	20
Aws Cert. Machine learning Specialty	15
Google Cloud Certified Professional Data Engineer	20

Best wishes wrapping up the semester and in the future!

Best of luck to all of you, as well!

Montana State University Computer Science Department

Graduating Senior Exam

Academic Year 2022-2023, 80 minutes.

Your performance helps us assess how well we are meeting our stated learning outcomes for computer science majors. To pass this exam, spend at least 45 minutes in order to provide a carefully reasoned answer to each question. This information will help us make improvements.

Name Jesse Russell

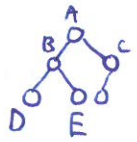
Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer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

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

a tree-map sorted by the score, it would be fast to get the largest score and tickets can be removed in O(log n) time

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

using a heap



B < A < C

D < B < E

theres a way of storing this ~~in~~ in an array, I think, but I can't remember how

A B C _ _ _ _ _

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

I don't remember the specifics you square the index of the node and add 0 or 1 to get it's children or something like that

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

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

Your solution:

```
def char_count(string, char):
    count = 0
    for c in string:
        if c == char:
            count += 1

    return count
```

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

Best case time complexity of algorithm:

O(1) per number added, O(k)

Explanation of best case time complexity:

each number added is bigger than the previous

the first number added is bigger than the biggest number in the list

1 2 3 ← 4, 5, 6

1 2 3 4 ← 5, 6, 7

1 2 3 4 5 ← 6, 7

etc.

Worst case time complexity of algorithm:

O(n) per number, O(kn)

Explanation of worst case time complexity:

or O(n/2), the number belongs in the middle

2 4 6 8 ← 5

2 4 6 8
↕
5

2 4 6 8
↕
5

2 4 6
↕
5

2 4 5 6 8

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)*
MilTech	web development (internship)	20 per week
	React	
	Typscript	

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

when an AI is trained on biased data so it becomes biased itself

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

if gender is included as a variable, and the data the AI was given to train on happened to have more men than women, it would be less reliable or accurate in regards to women

what ~~does~~ does this mean
~~google~~ google copied the code. or oracle?

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.

~~who~~ who wrote the code?

Side you choose to win: google, ~~oracle~~ oracle must delete the code from their code base

First possible impact: oracle loose market share

Second possible impact: google becomes more powerful

Third possible impact: Java is used less

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: from crashes

Second type of harm: social: taking people to the wrong destination

Third type of harm: societal: making people more reliant on google maps/navigation software and less able to navigate on their own

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 [redacted]
to a few places but haven't got any offers yet. ~~Quick~~ Quig was a possibility but they turned me down after the second interview.

I might have a spot at MiTech or possibly brightvine or Zoot

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

Organization Name	*Estimate Total Hours Spent*

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

Activity Description	*Hours Spent (estimate)*
eyrn 310	50 - 60

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: Saving ever commit but only storing the changes

Non-trivial feature 2: distribution - repositories

Non-trivial feature 3: branching and merging

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

Activity Description	*Hours Spent (estimate)*
learned react in a weekend	48
to get internship at miTech	
attended ~~career~~ career fairs	≈ 4

Best wishes wrapping up the semester and in the future!

Montana State University Computer Science Department

Graduating Senior Exam

Academic Year 2022-2023, 80 minutes.

Your performance helps us assess how well we are meeting our stated learning outcomes for computer science majors. To pass this exam, spend at least 45 minutes in order to provide a carefully reasoned answer to each question. This information will help us make improvements.

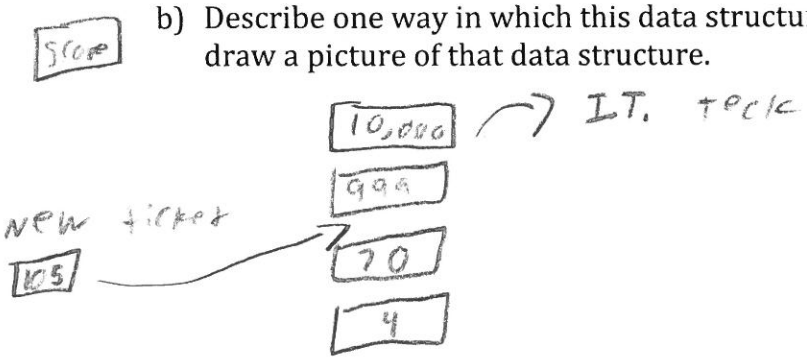
Name Devon Salveson

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.

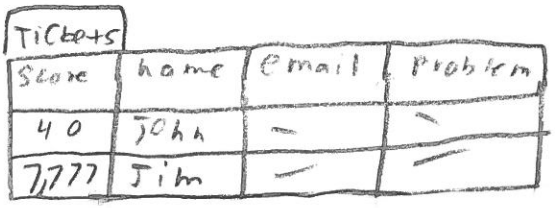
A queue where tickets are inserted not at the end, but by their urgency score would work.

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.

You could also add entries to an SQL table and retrieve results sorted by score




```
Select * From tickets
Order by score;
```

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

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

Your solution:

```
function countChar(str: string, lookFor: character): number {
    let count = 0;
    str.forEach((c) => {
        if (c === lookingFor) count++;
    });
}
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:

each k is less than the lowest value and is inserted without traversing the list

Worst case time complexity of algorithm:

O(n)

Explanation of worst case time complexity:

Each k is larger than the largest value and is inserted after traversing the entire 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)*
Big Sky Sun Sports	Smash Coord. Natl	100
Walmart Global Tech	SWE Intern II	400 (40hrs * 10wk)

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

Bias in choices made by an algorithm usually caused by non-diverse teams creating the algorithm or biased training data.

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

It could incorrectly favor certain prospective students due to biased training data.

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

Side you choose to win: Google

First possible impact:
Open other companies to take and use portions of the Java API or other software.

Second possible impact:
Would open the door for Google to use more Java API code.

Third possible impact:
Could establish a precedent of what / how much Code is legally ok to copy.

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

First type of harm:
Physical harm to pedestrians

Second type of harm:
Loss of work to taxi drivers if something like Waymo was wide spread.

Third type of harm:
Privacy invasion from cameras driving past homes

Zoom, Workiva, Amazon, Microsoft, Target, Home Depot, PayPal, TikTok,

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

I'm currently applying for jobs. I've filled out roughly 50 applications and have yet to get an interview. This obviously isn't ideal, but it's the unfortunate reality of the economy right now.

In October 2021 I started a live event production company where I design, develop, and maintain our graphics playback software. Recently, some promising opportunities for more work have come our way. I'm planning to continue this freelance work until the tech job market improves.

I'll be staying in Bozeman until my wife graduates from MSU next fall. We plan to move to Seattle.

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

Organization Name	*Estimate Total Hours Spent*

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

Activity Description	*Hours Spent (estimate)*
—	—

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

Name of most sophisticated version control system: Git

Non-trivial feature 1: Branching

Non-trivial feature 2: Pull requests

Non-trivial feature 3: Forking

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

Activity Description	*Hours Spent (estimate)*
Taught myself React & Typescript	20

Best wishes wrapping up the semester and in the future!

Montana State University Computer Science Department

Graduating Senior Exam

Academic Year 2022-2023, 80 minutes.

Your performance helps us assess how well we are meeting our stated learning outcomes for computer science majors. To pass this exam, spend at least 45 minutes in order to provide a carefully reasoned answer to each question. This information will help us make improvements.

Name Jaclyn Saunders

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. Any node can be searched and then deleted in any location.

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

When thinking of the structure of a linked list, each node has a pointer to the next node which reminds me of C and using pointers and structs.



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

Another implementation could be in Java using their premade structures from libraries. I think that this would look the same



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): Javascript

Your solution:

```
const countChar = (userString, character) => {
    let charNum = 0;
    for (let i=0; i < userString.length; i++) {
        if (userString.charAt(i) == 1) { charNum += 1; }
    }
    return charNum;
}
```

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 just adding to the end of the list, all it takes is inserting it. Nothing needs to be moved around.

Worst case time complexity of algorithm:

O(n)

Explanation of worst case time complexity:

if inserting at a specific location, iteration over the n amound of nodes has to happen

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)*
MilTech	internship, web dev	~ 2500
AWC	Participation	~ 10

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

Bias towards a certain outcome caused by the algorithm

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

Possibly all students who are more diverse get valued over academic value?

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:

Show that copyright is not tolerated

Second possible impact:

big companies cannot get away with anything they want

Third possible impact:

encourage people to use code but make it their own

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:

in case of an accident, a lot of harm can happen (death)

Second type of harm:

creates less aware drivers which could result in harm when using a non autonomous car

Third type of harm:

could financially harm the user (im sure they are expensive)

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

I am planning on moving to Colorado Springs. I am waiting to hear about an offer from MilTech for a full time webdev position. If not, I plan to apply for jobs at the beginning of summer for the Colorado Springs area for web dev.

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

Organization Name	*Estimate Total Hours Spent*
MSU cheer team	~3,000

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

Activity Description	*Hours Spent (estimate)*
MSU cheer	~3000
Multi disc eng. group	1 semester ~50

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

Name of most sophisticated version control system:

git

Non-trivial feature 1:

ability to have several branches of code

Non-trivial feature 2:

ability to go back to certain commits

Non-trivial feature 3:

open source

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

Activity Description	*Hours Spent (estimate)*
dev week 2023	~30
Job searching on linkedin	~15
Youtube videos about CS careers	~20

Best wishes wrapping up the semester and in the future!

Montana State University Computer Science Department

Graduating Senior Exam

Academic Year 2022-2023, 80 minutes.

Your performance helps us assess how well we are meeting our stated learning outcomes for computer science majors. To pass this exam, spend at least 45 minutes in order to provide a carefully reasoned answer to each question. This information will help us make improvements.

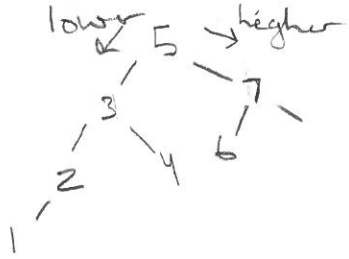
Name Erin Schuenemann

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.

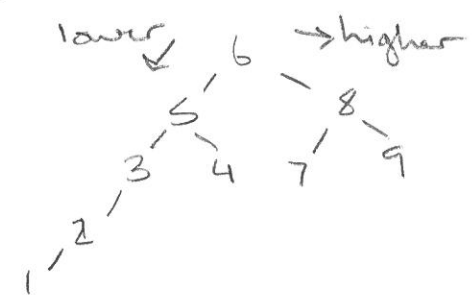
Binary sort tree, because the values would be sorted where lower values go in one half of the branch & higher vals in the other half

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.

Red – Black tree



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

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

Your solution:

```
def num_char(str, char):
    total = 0
    for c in str:
        if c == char:
            total += 1
    return total
```

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

Best case time complexity of algorithm:

O(k)

Explanation of best case time complexity:

All are lower than n so they get placed at the bottom of the linked list so it takes k steps

Worst case time complexity of algorithm:

O(kn)

Explanation of worst case time complexity:

All greater than highest # in n so they have to go through the list of n #'s k times .. therefore kn 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)*
Stats 216	TA	3 credit hours / semester

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

its when an alg has learned bias from training data

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

the training data could contain bias from the human admissions officers so it could show preferential treatment to certain types of ppl based on what the employees did

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:

cause people to need to pay to use proglangs

Second possible impact:

companies would create their own proglangs effectively tying their employees to the company

Third possible impact:

hard to get jobs at other companies due to specialized experience

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 ei crashing

Second type of harm: emotional harm ei being in crash

Third type of harm: monitary, expensive

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.

get a job in seattle, preferably in the medical tech business

I have no offers

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

Organization Name	*Estimate Total Hours Spent*
none	

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)*
classes?	so many, abt 120 credithrs

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 dont know what that is?

Non-trivial feature 1:

Non-trivial feature 2:

Non-trivial feature 3:

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

Activity Description	*Hours Spent (estimate)*
none	

Best wishes wrapping up the semester and in the future! thank you!

Montana State University Computer Science Department

Graduating Senior Exam

Academic Year 2022-2023, 80 minutes.

Your performance helps us assess how well we are meeting our stated learning outcomes for computer science majors. To pass this exam, spend at least 45 minutes in order to provide a carefully reasoned answer to each question. This information will help us make improvements.

Name Colin Schutte

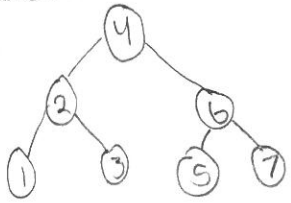
Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer 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 balanced tree could best model this situation, because it is quick to add and retrieve ranked integers even if there are a lot or big integers.

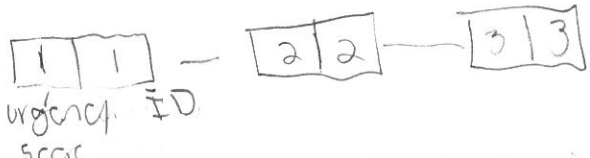
b) Describe one way in which this data structure could be implemented and draw a picture of that data structure.

Implemented as a balanced tree based on urgency score.



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

I don't know if each ticket has an ID and an urgency score, where it could have to be stored as a dictionary.



urgency score is the key to look up

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:

```
int charInString(char c, string s):
    numOfTimes = 0
    s = s.split()
    for i in s:
        if i == c:
            numOfTimes++
    return numOfTimes
```

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 would be if all k numbers were smaller than all n numbers, so you wouldn't have to iterate through all n numbers. You would simply just have to insert all k numbers at the beginning of the linked list.

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

Explanation of worst case time complexity:

The worst case time complexity would be if all k numbers were interwined in the singly linked list. Each time you insert a number, you would have to iterate between a worst case of n numbers plus the numbers you may have inserted already (up to k).

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

Organization	*Main Activities*	*Hours Spent (estimate)*

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

Bias based on unbalanced data in an algorithm.

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

Suppose that the data used in college admissions software is biased towards those with super high GPAs and standardized test scores. This would make it so that maybe a kid who should be accepted isn't

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: Ability to use JAVA API code freely to build systems

Second possible impact: Make money using JAVA API code

Third possible impact: Improvement to JAVA API code resulting in ~~eff~~ more use

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 - endangering the users of the software

Second type of harm: Might encourage others to develop autonomous cars that aren't safe

Third type of harm: Might encourage others to use this software for other kinds of transportation which may cause 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 traveling over the summer to improve my spanish speaking skills and visit other parts of the world as I am a spanish Minor and I have never been out of the country. Then, I plan on staring a job if I get an offer or look for a job if I haven't.

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

Organization Name	*Estimate Total Hours Spent*
church	100
IM basketball	30
IM volleyball	30
powerlifting	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)*
IM basketball	30
IM volleyball	30
Hospital security guard	200+
Hertz	200+

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

Name of most sophisticated version control system: Github

Non-trivial feature 1:

Cloning repositories from online to a personal machine

Non-trivial feature 2:

Saving commits and pushing code to update repository online

Non-trivial feature 3:

Sharing repositories with others

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)*
Montana Thigh Tech Networking	2

Best wishes wrapping up the semester and in the future!

Montana State University Computer Science Department

Graduating Senior Exam

Academic Year 2022-2023, 80 minutes.

Your performance helps us assess how well we are meeting our stated learning outcomes for computer science majors. To pass this exam, spend at least 45 minutes in order to provide a carefully reasoned answer to each question. This information will help us make improvements.

Name Josiah Schuster

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.

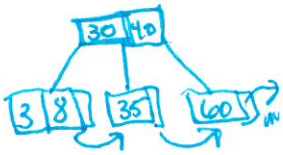
a) What simple data structure would best model this situation? Explain.

- Queue - Heap
- Stack - LL/DLL (okay)
- Hash
- Tree

* To model this situation I'd use a B+ Tree. Any ticket w/ any urgency score could be found with O(log(n)) TC.

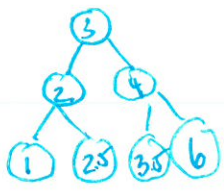
b) Describe one way in which this data structure could be implemented and draw a picture of that data structure.

* With a implementation of a B+Tree, you'd use recursive logic to build the tree and a linked list in between the children/leave nodes. Each node contains a "max" capacity of a number of list elements.



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

The second data structure I would use would be a sorted/balanced tree. It's the same idea as a B+Tree but without the linked list within each row in the tree. Time complexity is still O(log(n))



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

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

Your solution:

Java

```
public int charCount (String string, Char char) {
    int count = 0;
    StringArraylist = StringArray.(string);
    for(int i = 0, i < String.length(), i++ ){
        if (StringArraylist[i] == Char) {
            Count++;
        }
    }
    return count;
}
```

turn the string array into an array to iterate through.

Python

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) → adding one at a time.

Explanation of best case time complexity:

* The best case is if all the numbers you add are larger than the current list and all the ones you add are in ascending order. this is the case then O(k) time complexity or how many you add.

Worst case time complexity of algorithm:

O(log(n) + k)

Explanation of worst case time complexity:

The worst time complexity if you add floating numbers that are smaller and out of order from the current singly linked list. You will have to add and reorganize the singly linked 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)*
Mission Ranch	Ran Post House	2,000 - 3,000
Schwahn LLC.	Personal VFX business	400 - 500
Brigham	Undergraduate Research	50
Agile Fire	Front-end Internship	400
Personal Trainer	Lifted Heavy Weight	200
ACM	Member (Sophomore)	15

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

* Algorithms that favors certain data and certain ~~provides~~ outputs. Honestly have no idea....

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

In the case of the college admissions software, it could favor certain applicants over others which could provide an unfair advantage. Another case is Resume Screen Readers.

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 innovation by having access to source code (even if you steal it).

Second possible impact:

Could encourage more companies to pursue "infrigement" with a case of more relaxed laws. Aka they could get away from it.

Third possible impact:

* Companies might pursue of law to tighten patent laws to protect their IP.

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:

* Litterally kill people.

Second type of harm: class action

* Start lawsuits between self-driving car companies and groups of individuals.

Third type of harm:

* Unemploy truck drivers, uber drivers, delivery drivers, etc.. and marganalize the working class without a tech background.

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 started a business in College with my Friends called Mission Ranch I plan to pursue that. If that doesn't work out / I change my mind I plan on working in a Front-end / UX/UI role for a company I care about (Twitch, Spotify, Brightree, etc.)

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

Organization Name	*Estimate Total Hours Spent*
CRU (Campus Crusade for Christ)	300-500
Journey Church	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)*
Senior Capstone	150
Jake Jabs Entrepreneur Competition	10
EGEN 310	160

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 ??? What else...

Non-trivial feature 1: Git rebase

Non-trivial feature 2: Git remote set ~~url~~ remote <url>
<branch name>

Non-trivial feature 3: Git add .

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)*
Odin Project !!!!!!!!	100
Code Academy	100
Youtube (Tech w/ Tim)	100

Best wishes wrapping up the semester and in the future!

:)

Last "EXAM" !!

Montana State University Computer Science Department

Graduating Senior Exam

Academic Year 2022-2023, 80 minutes.

Your performance helps us assess how well we are meeting our stated learning outcomes for computer science majors. To pass this exam, spend at least 45 minutes in order to provide a carefully reasoned answer to each question. This information will help us make improvements.

Name Nathan Sheffels

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.

Descending linked ~~lists~~ list.

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

Nodes placed in descending order. Customer service can pop the highest urgency score.



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

Nodes placed in ascending order. Customer service can pop the last node to help.



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 funk (a, b):
    count = 0
    for i in range len(a):
        if (a[i] == b):
            count ++
    return (count)
```

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

Best case time complexity of algorithm:

O(1)

Explanation of best case time complexity:

Each number added is ~~smaller than the~~ the smallest of the n numbers and is placed at the front of the list. Each number k is evaluated 1 and only one time.

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

Explanation of worst case time complexity:

Each number is larger than all the others and added to the end of the LL.
n numbers evaluated 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)*

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

An algorithm that introduces bias.

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

If the algorithm is designed to "score" applicants, and gives a higher score to a particular sub-set of people. IE gender, race, economic factors etc.

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

Side you choose to win: Google

First possible impact: API code is public domain by law

Second possible impact: ~~Lang~~ Language publishers may no longer provide API's (so willingly)

Third possible impact: API code used in more projects.

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

First type of harm: Physical harm to the operater.

Second type of harm: Physical harm to pedestrians

Third type of harm: Physical harm to the vehicle → if software uses brakes during incorrect times and wears ~~oth~~ out the ~~brake~~ brakes.

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

Move home and apply for jobs.

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

Organization Name	*Estimate Total Hours Spent*

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

Activity Description	*Hours Spent (estimate)*
—	—
Software engineering 1/2	80

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

Name of most sophisticated version control system:

Maven

Non-trivial feature 1:

Compiles all dependencies

Non-trivial feature 2:

Ensures VC is consistent for all systems.

Non-trivial feature 3:

Easy dependency instalation.

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)*
Personal Python project	≈ 10

Best wishes wrapping up the semester and in the future!

Montana State University Computer Science Department

Graduating Senior Exam

Academic Year 2022-2023, 80 minutes.

Your performance helps us assess how well we are meeting our stated learning outcomes for computer science majors. To pass this exam, spend at least 45 minutes in order to provide a carefully reasoned answer to each question. This information will help us make improvements.

Name Simeon Shishov

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 tree with~~ ordered list list in order of urgency makes it easy to remove top or most urgent item when complete.

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

could literally be an array of datapoint which gets new data via loop placed in correct index

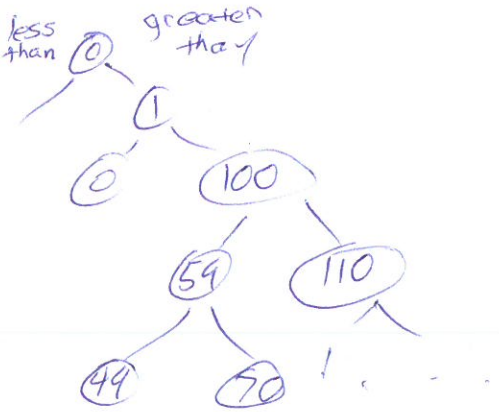
ie. [1, 10, 100, 1000]

we get new with urgency of 110

~~Sort for~~ loop through array until 110 =< next item and put in array

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

Second could be some sort of tree like . . .



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 number_occuriance(string, char)
    cntr = 0
    for x in len(string)
        if string[x] = char
            cntr += 1

    return cntr.
```

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

Best case time complexity of algorithm:

k

Explanation of best case time complexity:

k has values

Worst case time complexity of algorithm:

$k + n$

Explanation of worst case time complexity:

n has values k has values

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)*
First Lego League	Volunteer	5hrs

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

bias that a machine learning algo could develop where it may favor certain data instances over others

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

It could see that a significat portion of Admissions in a certain neighborhood were succesfull in college and begin to favor that geographical location

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 costly to develop software since harder to keep proprietary

Second possible impact:

more open source

Third possible impact:

more collaboration

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:

intentional harm to driven

Second type of harm:

hit pedestrian

Third type of harm:

collision

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

Plan to work

applied to boeing – offered position (tool engine)

applied to applied materials – (software eng)

applied to to many places to list tbh

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

Organization Name	*Estimate Total Hours Spent*
Journey	1.5hrs every Sunday
Grace church	10hrs total

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

Activity Description	*Hours Spent (estimate)*
Class projects	100 hrs

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

Name of most sophisticated version control system:

github (git)

Non-trivial feature 1:

manage pull request

Non-trivial feature 2:

issue Pushes

Non-trivial feature 3:

issue commits

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

Activity Description	*Hours Spent (estimate)*
career fair	10hrs
Personal Projects	100hrs

Best wishes wrapping up the semester and in the future!

Montana State University Computer Science Department

Graduating Senior Exam

Academic Year 2022-2023, 80 minutes.

Your performance helps us assess how well we are meeting our stated learning outcomes for computer science majors. To pass this exam, spend at least 45 minutes in order to provide a carefully reasoned answer to each question. This information will help us make improvements.

Name Luke Simonson

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

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

A priority queue would work best here - first in first out, but with urgency taken into account.

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

You could keep a sorted array of tickets and always put the highest priority on front.



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

You could use a linked list to implement this. Or a linked list of linked lists with each priority getting its own.

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

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

Your solution:

```
Def count_char(word, c):
    count = 0
    for char in word:
        if(char == c):
            count += 1

    return count
```

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

Best case time complexity of algorithm: O(k)

Explanation of best case time complexity: best case scenario, the next number in k always belongs in the front, so only need to iterate k times.

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

Explanation of worst case time complexity:

worst case, every k belongs in the back of the list, so need to iterate over n for every k

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

Organization	*Main Activities*	*Hours Spent (estimate)*
N/A	N/A	0

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

Algorithmic bias is when an algorithm may treat data differently depending on how it was written or trained.

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

AI facial recognition not recognizing people of color.

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:

Java API becomes proprietary and noone can use it.

Second possible impact:

sites like stackOverflow get shut down

Third possible impact:

Open Source projects reduce in popularity.

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

First type of harm:

not stopping when it should - hitting someone.

Second type of harm:

taking a wrong route and getting lost.

Third type of harm:

Driving off the road unintentionally

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

I plan to work I have applied to companies like Zoot, NavSea, Raytheon, and FAST. I got an offer from FAST and have interviews w/ Rathoon and NavSea

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

Organization Name	*Estimate Total Hours Spent*
N/A	0

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 work at FacilitiesIT.	2 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:

github

Non-trivial feature 1:

forking

Non-trivial feature 2:

pull requests

Non-trivial feature 3:

Merg conflict resolution.

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

Activity Description	*Hours Spent (estimate)*
taught myself rust	30
taught myself signal processing	30

Best wishes wrapping up the semester and in the future!

Montana State University Computer Science Department

Graduating Senior Exam

Academic Year 2022-2023, 80 minutes.

Your performance helps us assess how well we are meeting our stated learning outcomes for computer science majors. To pass this exam, spend at least 45 minutes in order to provide a carefully reasoned answer to each question. This information will help us make improvements.

Name Jacob Sitch

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

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

Array. A array of tickets

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

if an urgency score is > threshold it would be removed first

$A = [X_1, \ldots X_n]$

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

Dict with key and values

$$\begin{bmatrix} \text{Score}: & \text{ticket} \\ X_2 : & V_2 \\ \vdots & \vdots \\ X_n & V_n \end{bmatrix}$$

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

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

Your solution:

```
Def fun(string,c):
    tot=0
    for x in string:
        if c == x:
            tot++
    return tot
```

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

Best case time complexity of algorithm:

O^n

Explanation of best case time complexity:

I'd have to google this quickly for a reminder.

Worst case time complexity of algorithm:

O^{nk} I'd have to make a quick google to remember

Explanation of worst case time complexity:

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

Organization	*Main Activities*	*Hours Spent (estimate)*

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

I'm not positive that I learned about this. I assume it's about how algorithms have the ability to become bias towards certain groups and programmers must follow guidlines to prevent this

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

By focusing to much on data such as gpa's an algorithm could discount other charactoristics of an application, favoring specific groups and denying others

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

Side you choose to win: Oracle

First possible impact:

Sets precident for companies to sue anyone using their code

Second possible impact:

Third possible impact:

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

First type of harm:

Assumption of safety. Drivers letting their guard down by trusting the car.

Second type of harm:

Trolley problem. Auto cars may have to make split second decisions, choose who it will Protect.

Third type of harm:

Taxi/uber drivers. Will put them out of a job.

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 really need to work on my resume and portfolio. I have yet to apply for jobs or internships. I believe my biggest mistake throughout has been not getting an internship. I hope I can still find something quickly. I'm concerned that my peers are better prepared and may be a better choice when applying to jobs. I don't have a desired field to go into. I just want a job and to start working.

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

Organization Name	*Estimate Total Hours Spent*

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

Activity Description	*Hours Spent (estimate)*

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

Name of most sophisticated version control system:

Git

Non-trivial feature 1:

Collaboration

Non-trivial feature 2:

roll backs

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)*
General coding	On/off for multiple years

Best wishes wrapping up the semester and in the future!

I believe Carson Gross's classes to have been the best I took throughout my undergrad. The way his classes were taught was excellent. I'd also say that Laura Stanley's use of 15-20min videos at the start of the week is much better than the standard class. Most of the 50minutes is a waste in a lot of my experiences. Many classes could be condenced like Stanley's.

Montana State University Computer Science Department

Graduating Senior Exam

Academic Year 2022-2023, 80 minutes.

Your performance helps us assess how well we are meeting our stated learning outcomes for computer science majors. To pass this exam, spend at least 45 minutes in order to provide a carefully reasoned answer to each question. This information will help us make improvements.

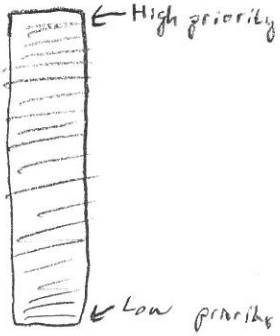
Name Zachary Snyder

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 simple stack. You can put high priority at the top and low priority at the bottom

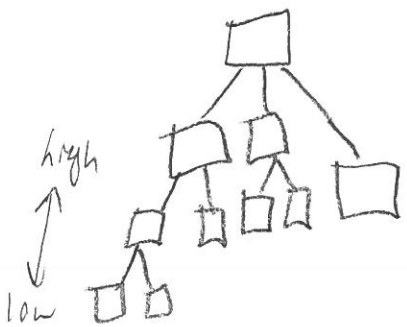
b) Describe one way in which this data structure could be implemented and draw a picture of that data structure.



Making a linked list that connects tickets based on priority

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

Making a tree with each level containing a different priority le



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

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

Your solution:

```
public int num (string, char) {
    int t=0
    for (i in string) {
        if i= char {
            t++;
    } }

    return t;
```

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

Best case time complexity of algorithm:

n^k

Explanation of best case time complexity:

The algorithm length is dependent on how many k exist exponentially

Worst case time complexity of algorithm:

n^{2k}

Explanation of worst case time complexity:

This would double the time from the last case.

I spent most of my time at another college so don't have much extracurricular involvement here.

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

Organization	*Main Activities*	*Hours Spent (estimate)*

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

The algorithm is bias due to the already bias data used to train it.

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

If a school was once all men and is know coed, an application algorithm wouldn't have much female application data to go through and would mostly favor men.

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: If Google won, companies could freely steal code and adjust it how they choose.

Second possible impact: If Google won, stealing code couldn't be discouraged since a large company did it to.

Third possible impact: Code copyright would have less meaning.

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

First type of harm: Running over a pedestrian to protect the driver.

Second type of harm: A bug in software that may drive car off the road.

Third type of harm: The ability for the car to be hacked

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 start working right away. Zoot is my first choice company but I will apply all around. I currently have an off From Los Alamos for a 1-2 year internship.

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

Organization Name	*Estimate Total Hours Spent*
Went to a church dinner	1

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)*
Adult League Soccer	30 hrs

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

Name of most sophisticated version control system:

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)*
Unity Game Engine	100

Best wishes wrapping up the semester and in the future!

Montana State University Computer Science Department

Graduating Senior Exam

Academic Year 2022-2023, 80 minutes.

Your performance helps us assess how well we are meeting our stated learning outcomes for computer science majors. To pass this exam, spend at least 45 minutes in order to provide a carefully reasoned answer to each question. This information will help us make improvements.

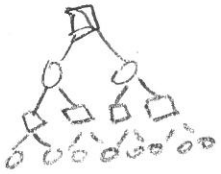
Name Stallbaumer, Kate

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.

Red Black tree the team could easily maintain the tree & remove the urgent tickets once addressed

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



As the tickets come in they can be assigned numbers & ordered

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



As the tickets come in they could just be linked, but that wouldnt be great

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:

```
exam (String, character)
    # y occurs in x
    return ycount
```

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:

one at a time

Worst case time complexity of algorithm:

$\log(n)$

Explanation of worst case time complexity: ascending order

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

Organization	*Main Activities*	*Hours Spent (estimate)*
Foundant Technologies	Engineering Intern	20+hrs/wk 4yrs

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

the algorithm reflects those who wrote it

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

If the software is written by only white males it's going to be biased for white males.

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 Oracle for the copied code & continues using it.

Second possible impact: Oracle denies Google the right to use the copied code going forward & Google figures out another way to run their system.

Third possible impact: Oracle uses their own code to build a better mobile system & people prefer it to Googles

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

Second type of harm: Bodily Injury

Third type of harm: Car Crash

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

Travel & volunteer

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

Organization Name	*Estimate Total Hours Spent*
N/A	

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)*
Engineering internship	20+hrs/wk 4 yrs

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: Github

Non-trivial feature 2: Easier teamwork

Non-trivial feature 3: clear documentation

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)*
Self-taught numerous languages	100+
Udemy courses	30+
Coursera courses	30+

Best wishes wrapping up the semester and in the future!

Montana State University Computer Science Department

Graduating Senior Exam

Academic Year 2022-2023, 80 minutes.

Your performance helps us assess how well we are meeting our stated learning outcomes for computer science majors. To pass this exam, spend at least 45 minutes in order to provide a carefully reasoned answer to each question. This information will help us make improvements.

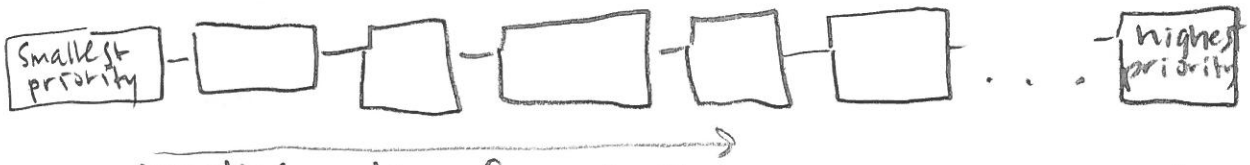
Name Jack Tetrault

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

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

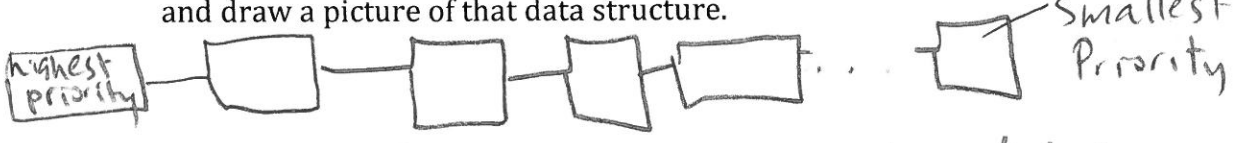
A linked list would best model this situation because it can be sorted in ascending or descending order based on the element it contains. It can also be manipulated regardless of list length, contrary to an arraylist.

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



One way this data structure could be implemented is by sorting from lowest priority to highest. Tickets with highest priority can be popped from the list

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



Another way of implementing a linked list in this situation is by sorting from descending order of priority. This method isn't as efficient, but the tickets with highest priority would be removed from the beginning of the list, and all the remaining elements would shift to the left.

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

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

Your solution:

```
public int containsChar(String s, Char c){
        int count = 0;
        for(int i=0, i<s.length, i++){
                if(s.charAt(i) == c){
                        count++;
                }
        }
        return count;
}
```

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

Best case time complexity of algorithm:

O(n)

Explanation of best case time complexity:

Because the list is already maintained in ascending order, the best case for adding additional point numbers isn't dependent on the length of the list. rather it only needs to evaluate a certain amount of nodes before finding its correct insertion spot

Worst case time complexity of algorithm:

O(1)

Explanation of worst case time complexity:

This worst case time complexity would be if the algorithm had to go through and check every node. For example, if we wanted to add a floating point number that was greater than the rest, and we started at the beginning of the list, it would take O(1) because it simply had to go through the whole list before inserting

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)*
NACOE	CSCI132 Lab TA	25
Three Rivers Engineering	Technical Intern	2.5 summers

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

Algorithmic bias is when certain algorithms provide an advantage/disadvantage or favor/disfavor a specific group.

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

Hypothetically speaking, imagine a college admission software that evaluates the chance that a CS applicant will stay in school and graduate. To make its computations the algorithm only uses datasets from 1980-2010. Because computer science has historically been dominated by white males, this could hypothetically result in algorithmic bias favoring white males. The programs evaluation process could be skewed towards white males, simply because there is more data to confirm their success in the industry.

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 cooperation and synchronicity when creating state of the art software. Software would accell more as a whole, because copyright isn't as strict. Less competition.

Second possible impact:

Large corporations can steal from smaller developers without risk of copyright infringement.

Third possible impact:

De-monopolization of software and algorithms.

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 from reliance on software, or error in software.

Second type of harm:

Economic Harm from decreased need for physical drivers.

Third type of harm:

Drivers Edueation harm from lack of driving. Not going to be as good at driving if the car usually just drives itself.

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.

Already accepted an offer for the position of solutions developer at Zoot Solutions in Bozeman.

Also applied with

- Quig
- Navsea Keyport
- Fast Technologies

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

Organization Name	*Estimate Total Hours Spent*
Library study group	A lot of 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)*
EGEN 310	Currently Enrolled
Embedded Systems	30
Engineering Internship	2.5 summers

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:

Edit history. Keeps track of changes made and when they were made.

Non-trivial feature 2:

File sharing. Ability to share multiple files in distributed version control.

Non-trivial feature 3:

Branching. Ability to branch out from files without changing centralized file.

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)*
Learn python after transferring in linkedin learning	10
Regularly watch cs youtube	—
Work on individual projects	—

Best wishes wrapping up the semester and in the future!

Montana State University Computer Science Department

Graduating Senior Exam

Academic Year 2022-2023, 80 minutes.

Your performance helps us assess how well we are meeting our stated learning outcomes for computer science majors. To pass this exam, spend at least 45 minutes in order to provide a carefully reasoned answer to each question. This information will help us make improvements.

Name Patrick Tung

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. Assign each ticket with priority and organize them into this structure accordingly.

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

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

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

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

Your solution:

```
private ~~void~~ int countOccurrence (String word, char c) {
    int count = 0;
    for letter in word:
        if letter.equals(c):
            count ++;
    return count;
}
```

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

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

Explanation of best case time complexity: There are $(n-1)$ elements waiting to be added. Each of them are added to their correct positions with no sorting required.

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

Explanation of worst case time complexity: There are $(n-1)$ elements waiting to be added. Each of them move n times to the end of the list.

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

Organization	*Main Activities*	*Hours Spent (estimate)*

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

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

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

Side you choose to win:

First possible impact:

Second possible impact:

Third possible impact:

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

First type of harm:

Software making a decision that leads to harm

Second type of harm:

Software malfunction that leads to harm

Third type of harm:

Illegally modified software leading to harmful results.

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

I was offered a paid part-time position at a project offered by the college of nursing. It's funded through a $500,000 grant. I received this opportunity from CS-Announce emails.

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

Organization Name	*Estimate Total Hours Spent*

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

Activity Description	*Hours Spent (estimate)*
Discord community	5

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

Name of most sophisticated version control system:

Git

Non-trivial feature 1:

Git stash save; save all local changes since last ~~commit~~ commit

Git stash clear; remove them

Non-trivial feature 2:

git push where you push code change onto a remote repo

Non-trivial feature 3:

git pull;

git push upstream main;

Git can work with GitHub and set up this triangle structure between 3 computers. Super handy.

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 University Computer Science Department

Graduating Senior Exam

Academic Year 2022-2023, 80 minutes.

Your performance helps us assess how well we are meeting our stated learning outcomes for computer science majors. To pass this exam, spend at least 45 minutes in order to provide a carefully reasoned answer to each question. This information will help us make improvements.

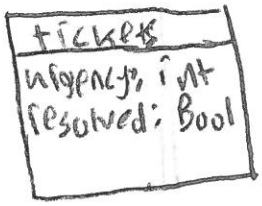
Name Brendan Verbrugge

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

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

I would just use a database sorted by urgency score with a boolean flag for resolved or not resolved

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



like, one big table sorted by urgency. when resolved goes to true it moves to another table.

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

Idk Maybe like multi-threaded lists that prioritize high urgency scores. Is that even a thing? It sounds cool.

$L_1(t_1, t_2\ t_3 \ldots)$

$L_2(t_1, t_2, t_3 \ldots)$ ← inferior list for inferior customers

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 detect_char(string, c):
    occurance = 0
    for character in string:
        if character == c:
            occurance += 1
    return occurance
```

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:

Probably O(n) or I guess O(k)

Explanation of best case time complexity:

for each k you just add the number to the list, there is no additional time complexity beyond adding each k to the list

Worst case time complexity of algorithm:

Probably not O(n), maybe like O(2n)

Explanation of worst case time complexity:

Since the list is maintained in ascending order, it may be the case that every k number will need to be sorted to the bottom of the list, in which case it will take much longer to add them all

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)*
Nope		

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

Ooo, is this like when algorithms are trained to be biased against a certain demographic? Bad stuff right there.

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

Mmm, maybe an algorithm that tends to reject applicants if their names are too "foriegn"

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.

Jarr harr harr
fiddle dee dee
it's a Pirates life for me

Side you choose to win: Google

First possible impact:

More incentive to write open source code since people can just take your code anyway

Second possible impact:

Maybe less investment as code can't be patented

Third possible impact:

All in all maybe coding becomes more collaborat-ive but more niche as there is slightly less profit to be gained

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

First type of harm:

Run over old Lady

Second type of harm:

Drive off cliff to avoid old Lady

Third type of harm:

Puts taxi drivers out of job?

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

I will return home and look for a job in the government probably. I have connections back home so I don't anticipate having too much trouble finding a job (I have worked for the government previously).

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

Organization Name	*Estimate Total Hours Spent*
I was a Quadling	2 years?
for 2 years (Quad f	
represent)	

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

Activity Description	*Hours Spent (estimate)*
Mostly EGEN 310	3 credits worth of
We build cyber truck	hours (Many)
robot - very cool	

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:

The only version control system I have ever used is GitHub

Non-trivial feature 1:

Lots of people can use a repo at the same time and it is easy to bring people into

Non-trivial feature 2: New repos

Creating new repos is easy

Non-trivial feature 3:

The ability to roll back changes to the repo or view a history of changes is quite usefull

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 taught myself	
a few languages, it	
was called CSCI 305	

Best wishes wrapping up the semester and in the future!

Thank you ☺