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 Liam Richard Alberghini

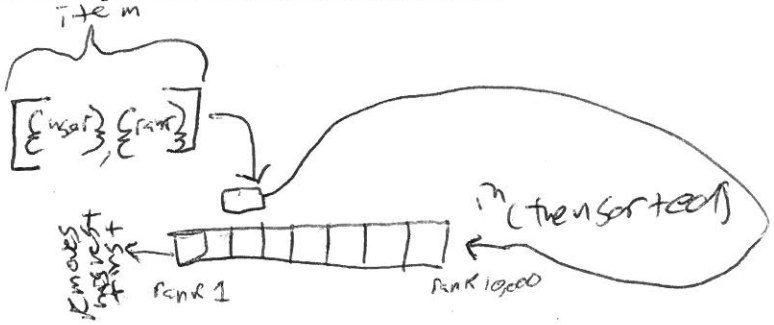
Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer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

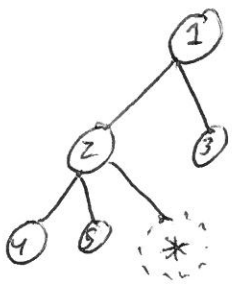
~~A ranked~~ last in first out, ordered list

(maybe just list is simple enough)

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.



when a new item is added it looks at is parent & if is higher it stays where it is, but if is smaller it moves up a branch, repeat until it finds its spot

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 findOc(strIn, charSearch):
    cnt = 0
    for i in strIn:
        if i == charSearch
            cnt += 1
        else:
            pass
    return cnt
```

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

Best case time complexity of algorithm:

Explanation of best case time complexity:

Worst case time complexity of algorithm:

Explanation of worst case time complexity:

To be honest the only thing I can remember about time complexity is something about big O & big O^2, however That's as far as I never understood it to start, and failed to take the necessary steps to fix it.

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)*
4x4 at MSU	offroading	100
Big O Tires	work	[redacted] (2 years)
Advanced Innovations	work	[redacted] (almost 3)

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

algorithmic bias is when the method you used to train a self learning algorithm imparts a bias on its eventual use functionality

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

lets say you use an pre-screening algorithm and you use it to weed out students before you send it to real people, if in your initial sample that you used to train the algorithm and you only used students of 1 race or sex, and you are looking to foster a diverse student body, your algorithm may remove too many students of your under represented groups.

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

Side you choose to win: Google

First possible impact: A legal enshrinement that you can't copy right code, it's all an algorithm that was probably first discovered by a logical philosopher.

Second possible impact: A move ~~from the industry to~~ fully open sourced b/c it's now not tenable to copy right code, just total applications.

Third possible impact:

More collaborative development between companies as now systems or core don't protected.

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:

1 If risk assessment is not done correctly they it may chose to harm a pedestrian/ driver when it shouldn't.

Second type of harm:

If the geo-data of the car was sent to govt actors who then used it for malicious purposes.

Third type of harm:

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

for the past 1,8 years I have been working as a product development engineer for advanced innovations in belgrade.
I specialize in embeded systems code for C based microcontrollers and database/server management for a remote data collection and analysis website.
I plan to work here, and hopefully get some money, buy a house/land, and settle down in the galiatin valley.

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*

(my free time was working)

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)*
Big O Tire (mechanic)	1 year
Advanced Innovations & engineering team member	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:

Git Hub

Non-trivial feature 1:

Issue tracking & resolution management

Non-trivial feature 2:

Roll back versions for each major version or commit

Non-trivial feature 3:

Branch management for Colaborative work

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

Activity Description	*Hours Spent (estimate)*

Honestly, all I did in college was work I never really got to do stuff like that, but hey i don't regret it

Best wishes wrapping up the semester and in the future!

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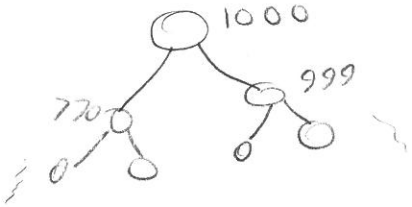
Name Moiyad Alfawwar

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.

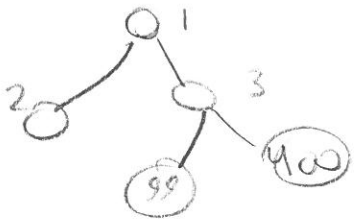
reverse binary search tree. Easily sorted and accessing tickets should be very quick.

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



revese as in highest urgency on top

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



normal binary search tree to allow different levels of employees to access certain low level urgency tickets that do not require higher level technical skills.

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 (str, char):
    count = 0
    for i in range (len(str)):
        if str[i] = char:
            count = count + 1

    return count
```

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

Best case time complexity of algorithm:

log (1)

Explanation of best case time complexity:

k is smaller than the smallest n. Therefore it is inserted in the beging of the list without the need to sort

Worst case time complexity of algorithm:

log(n)

Explanation of worst case time complexity:

k is smaller than the largest n in the list there fore we have to loop ~~across~~ through the whole list to sort assuming we are sorting in worst case scenario and 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)*
Undergrad Course Assistant	Lab grading	~10 hours

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

An algorith that is not fair to all situations. Sides to a specific type of input or data.

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

college admission Algorithms sends admissions of non popular names to spam folder.

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:

Advancement of mobile software appos

Second possible impact:

possible Free licesing for android
↑
more

Third possible impact:

popular apps such as Youtube doesn't get temporarily stopped to rewrite API functions

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:

~~driving~~ runing humans or animals over with the car

Second type of harm:

Runnig Red lights

Third type of harm:

Speeding over the speed limit of a various streets

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

Work as a cross platform application developer using web technologies. I plan to be a trainee (OPT) and then get a job, currently can't apply until I recive OPT card, I also love data analysis and UI/UX.

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*
4N Network	>100 hrs

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

Activity Description	*Hours Spent (estimate)*
Design Engineering class (different majors	~ whole semester
one project)	

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: merging branches.

Non-trivial feature 2: sub module repositries.

Non-trivial feature 3: rebasing repository.

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

Activity Description	*Hours Spent (estimate)*
Linux OS	~ >100 hrs
Golang	>5 hrs
Rust	~ >20 hrs
Vim / Neovim	20 hrs

Best wishes wrapping up the semester and in the future!

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Name Silas Almgren

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.

In the real world this would be done with a well designed system, in academia an ordered list would work fine.

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

ticket_urgencies = [lower urgencies ... higher]

Just a list where tickets are inserted in order, show the higher ones first

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

Or use a DB where the urgency is recorded and query to get them ordered by urgency



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

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

Your solution:

```
def count_char(s, c):
    count = 0
    for char in s:
        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:

One node traversed for each insertion

Worst case time complexity of algorithm:

$O(n^k)$

Explanation of worst case time complexity:

Traverse entire list for insertion

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)*
Neuralynx Inc.	SE internship	~15hr/wk for 2 yrs
C.H. Robinson	SE internship	~25 hr/wk for 10 months
MSU Intramural	Ultimate Frisbee	~60 hrs

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

This bias is where an algorithm produces results in-favor for some kind of group based on either the algorithm itself or the data it was trained on.

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

Perhaps the algorithm unfairly/unequally rejects a certain demographic of students.

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

Side you choose to win: Oracle

First possible impact:
If Google had won, it would set a bad precedent for attempting to copyright/patent Open Source systems.

Second possible impact:
Again, had Google won I think it would contribute to the problem were seeing of tech companies becoming monopolies

Third possible impact:
Google could just start copyrighting any parts of any language API.

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

First type of harm:
Physical harm - bad driving, impacts others

Second type of harm:
Economic harm - automating trucker's out of jobs

Third type of harm:
Theft - an exploitable flaw in the system could maybe let people hijack & have the cars drive away (it's a silicon valley reference)

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 a remote job offer doing Software engineering for a large logistics company called CH Robinson.

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

Organization Name	*Estimate Total Hours Spent*
NA	

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

Activity Description	*Hours Spent (estimate)*
N/A	

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

Name of most sophisticated version control system:

Git

Non-trivial feature 1:

Branching

Non-trivial feature 2:

Reverting

Non-trivial feature 3:

Committing

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

Activity Description	*Hours Spent (estimate)*
Code 24 Hackathon	24 hrs

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Name Luke Armijo

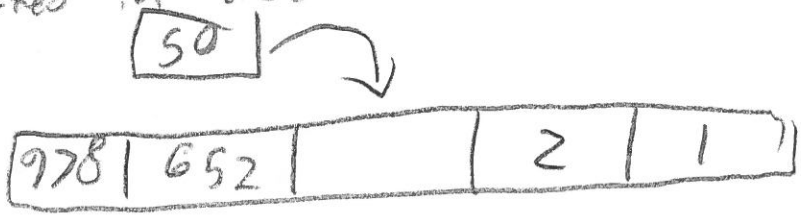
Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer 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 because we can arrange the tickets by the urgency #. we can also increase/decrease the size of the Array depending on the number of tickets.

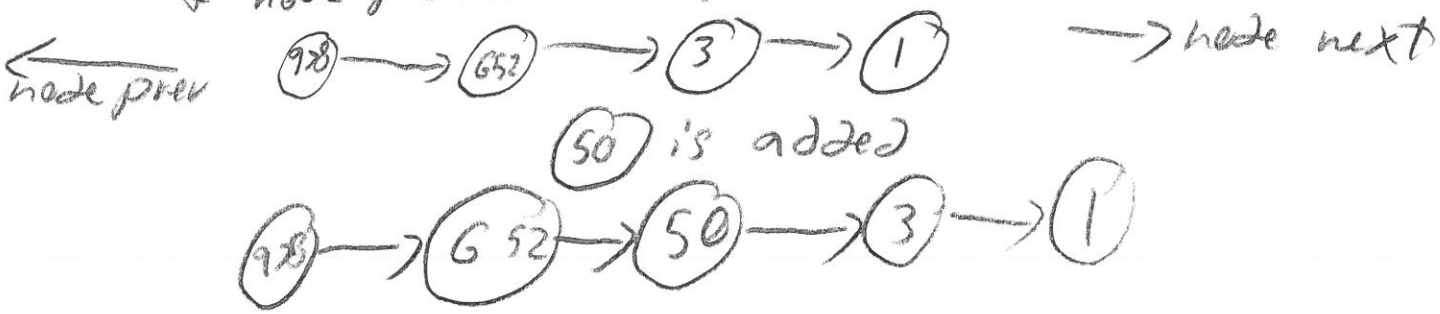
b) Describe one way in which this data structure could be implemented and draw a picture of that data structure.

An array where the higher priority is towards the front + when a new ticket appears it is inserted in order



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

Linked list where every number is connected in order. when a new ticket is added the node next + node previous is updated



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

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

Your solution:

```
function HowMany (Str Word, Char letter){
let count = 0;
for(i=0, < word.length(); i++){
  if( letter == word.charat(i)){
    count ++}
}

  Return Count;


}
```

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

Best case time complexity of algorithm:

O(n)

Explanation of best case time complexity:

you only have to go through the list once because they are already in order so you just have to possibly check each number ~~once~~ once + there are n numbers

Worst case time complexity of algorithm:

O(n)

Explanation of worst case time complexity:

the list is ~~already~~ already in order and because of this you just have to go down the list until you find its spot. Worst case it's in the very last spot so you had to check every other before you get there

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

Organization	*Main Activities*	*Hours Spent (estimate)*
had no extracurricular	community involvement	

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

it is the basic time to run an algorithm?

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

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

Side you choose to win: Google

First possible impact: More people start to copy code

Second possible impact: Api + info about code become more secretive because no one wants to be sued.

Third possible impact: Code becomes less colaborative and it becomes difficult to bring languages together.

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 of passengers if it were to crash

Second type of harm: Malevs intent. Someone could hack into the car + take control

Third type of harm: mental harm, other drivers might feel in ~~danger~~ danger being on the road w/ a self driving car

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

I plan to work. Not really sure where yet. Haven't really applied anywhere yet. Might work with this other student on the startup he created "posted". that was my one offer so far.

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

Organization Name	*Estimate Total Hours Spent*
was not involved	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)*
work: manager @ Colombos	15-20 / wk

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:

Switch?

Non-trivial feature 1: Combing use of touch screen w/ buttons + sticks

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	0

Best wishes wrapping up the semester and in the future!

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Name Griffin Austin

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.

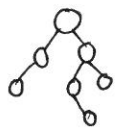
a) What simple data structure would best model this situation? Explain.

Priority queue. Highest urgency tickets would be at the top of the queue. New tickets would be placed depending on their urgency. Highest urgency ticket popped when needed.

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

Organized as a tree for $\log n$ traversal.

highest → urgency



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

Sorted list. The highest urgency ticket would be at index 0, lowest at index $n-1$, where n is the number of tickets.

[20], [5], [3], [1]

^ New ticket with urgency [10] inserted here

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_occurrences(s, c):
    counter = 0
    for char in s:
        counter += c == char
    return counter
```

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

Best case time complexity of algorithm: O(1)

Explanation of best case time complexity:

Best case, each new k is the lowest number in the list.
Only 1 comparison is necessary: comparing each k to the first element in list ∴ best case is $O(k) = O(1)$

Worst case time complexity of algorithm: O(n)

Explanation of worst case time complexity:

Worst case, each new k is the largest number in the list.
In this case, the entire list must be traversed for each k
∴ worst case is $O(kn) = O(n)$

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)*
D.A. Davidson	IT Risk Intern	400
D.A. Davidson	Software dev intern	360
Amazon	Software Engineer intern	480

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

Incomplete or flawed training data resulting in incorrect output data.

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

The software could rate ~~applicants~~ international applicants worse than domestic applicants due to the fact that much fewer international applicants apply. Less training data may cause incomplete predictions.

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

Side you choose to win: Google

First possible impact: open-source code becomes much stronger as they are free to use the Java API.

Second possible impact: Code obfuscation becomes more common as businesses attempt to protect their code without copyright

Third possible impact: Major API developers consolidate power as there is less reason to consider alternative options as it is easy and free to use the Java API. Less competition

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: Trolley problem. The car may have to choose whether to kill the passengers or run over people on the road.

Second type of harm: Privacy harm. The software may collect user, driving, and location without clear, explicit, and informed consent from the user.

Third type of harm: Defective software. Improperly tested software could result in operational malfunctions, thus causing a 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.

I plan to accept my full-time return offer for Software Development Engineer at Amazon. I plan to work there for at least a year starting after graduation.

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

Organization Name	*Estimate Total Hours Spent*
Competitive e-sports 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)*
Internships	1,200

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: git

Non-trivial feature 1: Branching

Non-trivial feature 2: Reverting to any current or previous commit

Non-trivial feature 3: Blaming

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)*
Reading StackOverflow	20
Free nodeJS bootcamp	80
Attending CS guest speaker lectures	5

Best wishes wrapping up the semester and in the future!

Montana State University Computer Science Department

Graduating Senior Exam

Academic Year 2022-2023, 80 minutes.

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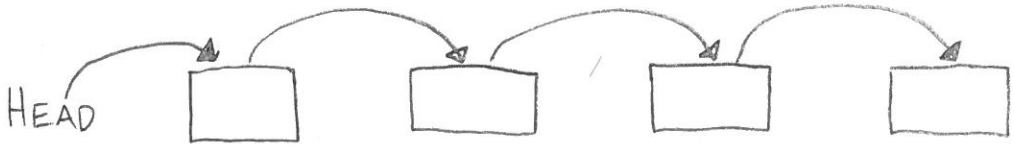
Name COLE BROOKS

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

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

Linked List of tickets sorted by urgency

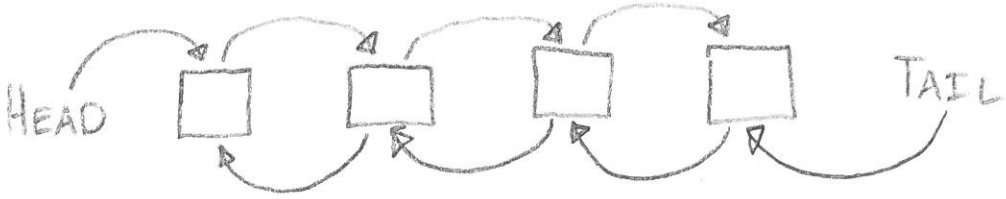
b) Describe one way in which this data structure could be implemented and draw a picture of that data structure.



Singly linked list w/ Head pointing to highest priority

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

Doubly linked list gives more flexibility



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

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

Your solution:

```
def count(word, char):
    n = 0
    for c in word:
        if c == char:
            n += 1
    return n
```

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

Best case time complexity of algorithm:

O(1)

Explanation of best case time complexity:

Every new number is the smallest number seen thus far, so it can just be inserted at the head of the list.

Worst case time complexity of algorithm:

O(n)

Explanation of worst case time complexity:

Every new number is the largest number seen thus far, so you must traverse the entire list before insertion.

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)*
TITIN KM BIOMEDICAL	Programming, Circuit design	Hundreds

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

An algorithm that doesn't treat all inputs equally, or whose outputs tend to skew a certain way.

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

It could prioritize certain groups of people over others for non-academic reasons.

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

Side you choose to win: Google

First possible impact:

More companies feel comfortable repurposing other's code.

Second possible impact:

Companies are encouraged to license their software more freely.

Third possible impact:

Consumers likely get a better product.

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

First type of harm:

Bodily harm in the event of an accident.

Second type of harm:

More pollution via inefficient routing algorithms.

Third type of harm:

Vulnerable code could be attacked and misused.

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 continue to work full time as an embedded systems engineer at Titin KM Biomedical while I pay off my debt. I'd like to go to grad school for electrical engineering within 5 years.

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. Obviously.

Non-trivial feature 1:

Merge vs. rebase

Non-trivial feature 2:

submodules

Non-trivial feature 3:

Branching

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

Activity Description	*Hours Spent (estimate)*
CCNA	100+
Learning C/C++	100+

Best wishes wrapping up the semester and in the future!

Montana State University Computer Science Department

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Name Jack Brown

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? - loop to find the largest value
An array?

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



loop over the array

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

I do not know

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 func(str, char):
    arr = str.split()
    count = 0
    for i in range(len(arr)):
        if arr[i] = char:
            count++

    return(count)
```

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

Best case time complexity of algorithm:

kn

Explanation of best case time complexity:

since it is one at a time, the complexity is linear n times however many k's there are.

Worst case time complexity of algorithm:

n^2

Explanation of worst case time complexity:

There could be n k's.

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

Organization	*Main Activities*	*Hours Spent (estimate)*
Lab Assistant	Helping Students	20

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

I don't know what that is.

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

The algorithm detects patterns of kids w/ certain names getting good grades so then any kid w/ that name automatically gets a good grade.

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:

Company's must state where their code came from.

Second possible impact:

More diverse code in programs

Third possible impact:

I don't know

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

First type of harm: Physical Harm - if car crashes

Second type of harm: Information/ Harm - cars store data such as home address & all phone information.
Privacy

Third type of harm: Financial 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.

My one year plan is to get a job. I have applied to around 50 companies/positions at both the career fair and online. I have not recieved any offers.

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

Organization Name	*Estimate Total Hours Spent*
Rec Dodgeball Team	15

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	over 50 hours

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

Name of most sophisticated version control system: Git

Non-trivial feature 1: Good UI

Non-trivial feature 2: Built into most IDE's

Non-trivial feature 3: well known

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)*
IOS Swift Self Learning	10
Career Fairs	8

Best wishes wrapping up the semester and in the future!

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Name Jacob Brown

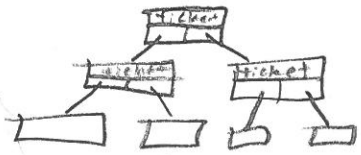
Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer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

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

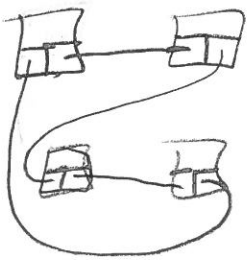
A red - black tree. Each ticket could be stored based on urgency score so it's always sorted and the most urgent would be the right-most ticket

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

A linked list in Java, each node with a pointer to left or right child.



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



Some sort of object oriented approach. A bunch of ticket objects with fields that point to other tickets more or less urgent. Also store most and least urgent somewhere.

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

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

Your solution:

```
def charCount(searchString, letter):
    count = 0
    for l in searchString:
        if l == letter:
            count += 1
    return count
```

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

Best case time complexity of algorithm: $O(\log n)$

Explanation of best case time complexity:

Taking the middle element every time, check if new number is lt or gt that number and recursively search through elements on the corresponding half of the remaining list. cuts list in half each time until correct slot is found.

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

Explanation of worst case time complexity:

Just search through each element one at a time until you find the two that the new element fits between and insert there.

Searching through the whole list is $n \cdot k$ comparisons. $O(n)$

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)*
Cru - Campus ministry	Bible Study, weekly worship gathering	500
Church	Attending, Volunteering	200
Residence Life	Worked as an RA for 1 year	500
Intramural Sports	Played multiple sports, worked as referee	50

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

Bias an algorithm has based on the specific problem in mind when it was developed.

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

Oh, are we talking about like racism here? Or other discrimination? Not like machine learning. Idk. The algorithm could be looking only for certain quantitative things in applicants and not be considering other valuable factors that make up an applicant.

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:

No code sharing even without due payment to the creator

Second possible impact:

Reduces collective improvement of the industry and community if every one protects their code a ton

Third possible impact:

I get sued for learning something through stackoverflow and implementing it in my program.

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 of humans operating car due to negligence in code.

Second type of harm:

Death of others on roads due to negligence in code

Third type of harm:

General loss of driving skills in the community seems like a negative. Reliance on computers over self.

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

I plan to get a job. I have applied to sever positions such as Data Scientist, Data Engineer, Analyst for several professional sports teams. Jobs serving player and team development through data. I need to apply for more software heavy jobs that might be more "normal" for a CS grad, but they all sound so 1) boring and 2) like I have no idea how to fulfill any of their expectations. Maybe I'll just be a waiter so I can stay in Bozeman.

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 (Bible study, worship gatherings)	500
All the things for	
Question 4 except	
being an RA	

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

Activity Description	*Hours Spent (estimate)*
Working as an RA	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:

Git Hub

Non-trivial feature 1:

Forking to have multiple different branches edited at once.

Non-trivial feature 2:

Merging these branches back except I have no idea how it chooses which changes to keep.

Non-trivial feature 3:

All I got is push/pull/restore old versions but that all seems pretty trivial.

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)*
Volunteered work for MSU football coach, running some analysis on play calling data and learning how to format an Excel sheet as output using Python library	60

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Name Makayla Brayles

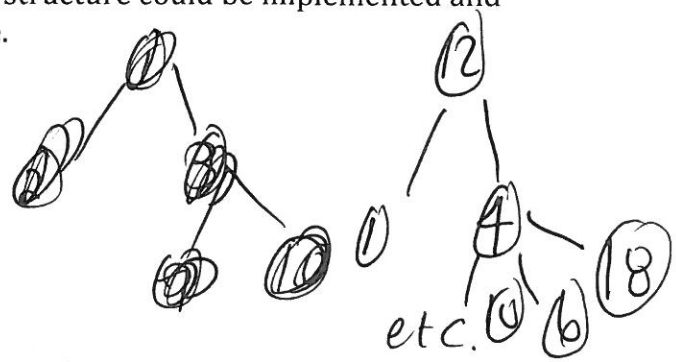
Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer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

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

Binary Search Tree

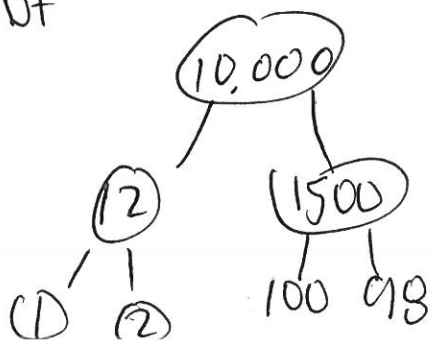
b) Describe one way in which this data structure could be implemented and draw a picture of that data structure.

add each node to tree and search for largest



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

Red-black tree where when a new node is added check parent if larger until it is less than the parent or root



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 returnNumChar (string str, char c){
                                          int count;
arrStr = String.toArray()
    for(int i=0; i < arrStr.length, i++){
        if (arrStr[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:

(0)(logn)

Explanation of best case time complexity:

idk

Worst case time complexity of algorithm: O(n)

Explanation of worst case time complexity:

you are adding 1 (n) at a 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)*
~~Boise~~ Zoot Intern	development	20 hr/week

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

when an algorithm only sees a certain set of data (not true to real life) and creates a bias

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

Algorithm bias could be caused by only seeing a certain population of admissions such as more males w/ 4.0 than females, causing the software to think males are more likely to have a 4.0 + accept their admission applicatio

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

Side you choose to win: Oracle

First possible impact:

open source code is unable to be ever used in a commercial setting

Second possible impact: possible to have not copied it but it is just similar which is hard on developers if it can't even be similiar

Third possible impact:

Cannot use anyone else's 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:

lack of detection of human pedistrians

Second type of harm:

uncontrollable accelerator/deceleration by a human if the car were to have problems

Third type of harm:

car crash from algorithm/software bug.

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

I plan to work at Zoot enterprises as a microservices developer. I have already been accepted and currently work part-time in this position

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

Organization Name	*Estimate Total Hours Spent*
NA	

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

Activity Description	*Hours Spent (estimate)*
NA	

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

Name of most sophisticated version control system: github

Non-trivial feature 1: branching

Non-trivial feature 2: revision history + revert

Non-trivial feature 3: Collabration

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)*
udacity - learning C# + Swift	30 hrs

Best wishes wrapping up the semester and in the future!

Montana State University Computer Science Department

Graduating Senior Exam

Academic Year 2022-2023, 80 minutes.

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

Name Joseph Burke -02569187

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.

among simple structures, a hashmap (dictionaries) would be best here. It allows you to get a constant lookup time if desired

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

```
data = {
[1] = {custid},
[300] = {custid},
}
```

you could use urgency score as keys to be able to easily (computationally) find the next most urgent. this assumes urgency is unique, though. the values would be customer ids, and any other cust data. (nested maps)

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

instead, you could use customer ids as keys to have constant lookup of customers, but it would increase complexity for finding urgency. values would be urgency data along with any other customer data. (nested maps)

```
data = {
    [custid] = {urgency},
    [custid] = {urgency}
}
```

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

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

Your solution:

```
function count(str, pattern)
    return -, count string.gsub(str, pattern, "")
end
```

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:

$\Omega(k)$

Explanation of best case time complexity:

each k is the smallest number and is added immediately

Worst case time complexity of algorithm:

$O(n^k)$

Explanation of worst case time complexity:

each k is the largest number in the list and every node was checked 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)*

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

by giving an algorithm biased data it will (potentially) output biased returns

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

by providing the algorithm data on school success rates, it could be biased against underprivileged kids who have lower success rates due to factors not in their control.

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

Side you choose to win: Google

First possible impact:

without worrying about who owns what, development of improved tech can proceed unhindered. paving the way for code utopia.

Second possible impact:

nobody can make money in code anymore due to it all being open and the entire field comes to a screeching halt.

Third possible impact:

some mixture of the first two

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

damaging those around it

Second type of harm: psychological

being forced to choose who lives and who dies.

Third type of harm:

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

plan to find work ASAP. 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*

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 allows me to create patches while working in the same project.

Non-trivial feature 2:

forking allows me to work on other's projects and contribute my own code directly without messing their code base up

Non-trivial feature 3:

this is more github, but project collaboration and code review allows owners of code to get code for their project without messing up their code.

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

Activity Description	*Hours Spent (estimate)*
taught myself Lua	> 1000s
made project in Lua	
learned intricacies of github	100

Best wishes wrapping up the semester and in the future!

Montana State University Computer Science Department

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Name Nicholas Ceccanti

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.

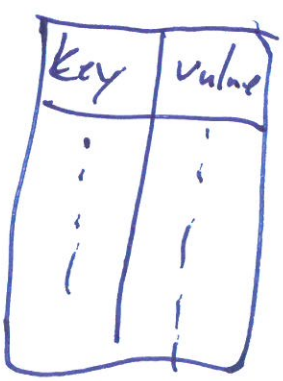
a) What simple data structure would best model this situation? Explain.

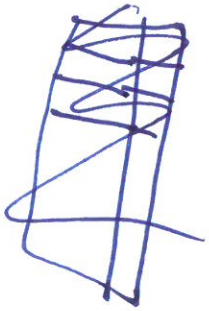
Hash map where the key is customer name and value is urgency score. Its the best because querying is O(1) and you are only storing key-value pairs with no relation.

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



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





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

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

Your solution:

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

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

Best case time complexity of algorithm:

$O(1)$

what does that even mean? Greater or equal to?

Explanation of best case time complexity:

If there are zero existing nodes in the list and 1 node to insert only one operation needs to occur, which is assigning the head to the new node

Worst case time complexity of algorithm:

$O(n^k)$

Explanation of worst case time complexity:

In order to maintain order upon insertion you must traverse the list at least n times to find the correct position to insert the node. You must do this 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)*
US Department of the Air Force	Paid Internship	~360 hours
Volair Technologies Inc	Paid Internship	~140 hours

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

The bias the an algorithmic creates in decision making? No clue

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

An algorithm looks for keywords in an application. In order to get "accepted a certain amount of keywords must be found. You are filtering out applications without the keyword instead of bad students.

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

Side you choose to win: Oracle

First possible impact:
Companies cannot profit off of some elses code

Second possible impact:
Nobody can use others code without worrying about being sued.

Third possible impact:
Oracle cannot enforce the patent because the Java API is public knowledge

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: Unintentional harm. Doesn't detect a pedestrian and kills them

Second type of harm: Puts manually driving car companies out of business. Bad Economic

Third type of harm: Bug in software allows hackers to remotely control vehicle and crashing intentionally

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 continue to work at the company I currently interna at, Valmir Technologies Inc. Work there until Fall 2024, then go to graduate school at MSU.

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

Organization Name	*Estimate Total Hours Spent*
Intramaural Cornhole	1 hour
Country Dance Club	~10 hours

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

Activity Description	*Hours Spent (estimate)*
None	0

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

Name of most sophisticated version control system:

Git

Non-trivial feature 1:

Version Control

Non-trivial feature 2:

Central code base

Non-trivial feature 3:

Merging of different version of code base

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

Activity Description	*Hours Spent (estimate)*
Leetcode problems	Too many
Networking with software engineers	~20 hours

Best wishes wrapping up the semester and in the future!

Montana State University Computer Science Department

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Name John Chiki

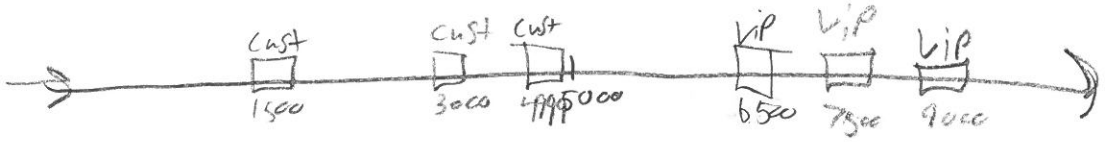
Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer 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, it has a system that allows for more functionality than a standard queue for certain elements to be put in front of other elements

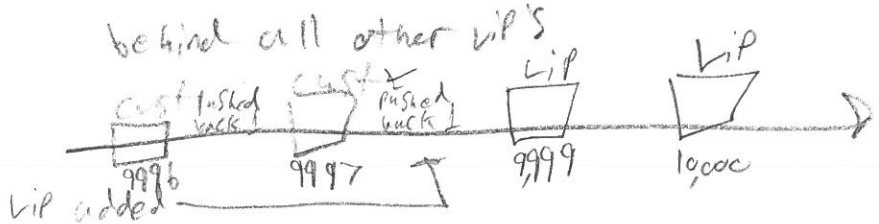
b) Describe one way in which this data structure could be implemented and draw a picture of that data structure.

VIP's have a minimum urgency of 5,000 and max of 10,000, non-VIP's have a max urgency of 4,999 and min of 1



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

VIP's could enter the queue with a priority of 10,000 with each subsequent VIP entering with a priority of 1 less each time a cust is added, they are added at the back of the queue. VIP's are added at the front of all non VIP's but behind all other VIP's



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_canter(String string, Character ch)
    cant=0
    for(i in range(len(string));
        if(string[i]==ch);
            cant+=1

    return cant
```

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:

each element can be added to the beginning of the list, meaning it only has to traverse the list k times.

Worst case time complexity of algorithm:

n · k

Explanation of worst case time complexity:

each element has to be added to the end of the list, so the entire list must be traversed each time

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

Organization	*Main Activities*	*Hours Spent (estimate)*
Cross life	worship in committee	250
chi alpha	committee worship	75
river building groups intern	development work	360

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

never heard of, what class was this in?

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

not sure

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

First possible impact:
Code can be copyrighted

Second possible impact:
no one uses anyones API's anymore, making communicating between software nearly impossible outside of deals

Third possible impact:
languages become copyrighted making each company make 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:
could mistake objects and people in an emergency, causing injury

Second type of harm:
car company could determine worth of people via prioritization of certain groups of ethnicities, in accidents

Third type of harm:
could prioritize animals over people, killing passengers over wildlife in accidents

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 moving to Indiana to work for Nucor Buildings Group for a job offer I recieved after an 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*
Grace Bible Church	130
DND	200

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

Activity Description	*Hours Spent (estimate)*
D/D	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:

Git Hub

Non-trivial feature 1:

See who comited what when

Non-trivial feature 2:

merging code bases

Non-trivial feature 3:

reverting to a commit.

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

Activity Description	*Hours Spent (estimate)*
Built TNe NAS Server	20
Built Pi hole DNS Sinkhole Server	30
Configured several computer systems	15
Set up and experimented with several linux distributions and desktop environments	60
Experimented with configuring software	100
Provided tech support to others	200

Best wishes wrapping up the semester and in the future!

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Name Kruize Christenson

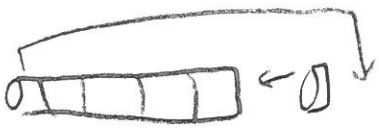
Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer 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 beliue it is some kind of find. I can't rember the name but it is alons this line push or pop where it either add it to the top the gets rid of it when done.

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



this would be impamented similar to an while loop

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



This would be a find statment

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:

```
char my char = "n"
str my string = " the string
int charaters = 0

int i = 0
while (length. my string > i);
    if (my string [i] == n) :
        charaters ++ ;

    i ++

print ("Number of " + str (my char) + " = " + str (charaters))
```

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:

This means a computer can solve the problem in a reasonable time

Worst case time complexity of algorithm:

O^{n^n}

Explanation of worst case time complexity:

This mean it will take an imposible amount of time to compute. This is where theory comes in

32
16 512
1 2
320
16 x 4 x 8
16 x 32

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.

Longer add
pool in
-w hall
or testing

Organization	*Main Activities*	*Hours Spent (estimate)*
Robo Cats	Robo Sub competion	530
ACM	Employer + actives	200
AWC	Employer + activies	200

Iso add
club room
or all
5 clubs

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

this is where an algorithm is based only on a set group. Let's have it identify food but only use fruit. It would get confused with meats, vegable, fish, etc,

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

For gpa wise + having a dyslexia disability using only gpa to determin if someone is smart is very bias. Some time test need extra time + isn't given in high school

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

Side you choose to win: Oracle

First possible impact: Every comphy would have to make custom coding languages

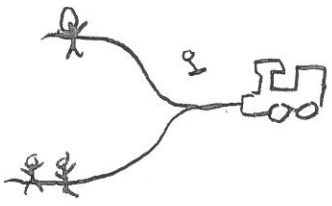
Second possible impact: Other companys would get sued

Third possible impact: open sourc would disapear

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

First type of harm: mis identifying object

Second type of harm: causing murder (train track desision)



Third type of harm: cuns wreks for driving lawful rather with flow

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

work but um still looking for a job either with local irrigation company or elsewhere, I realy like automation

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*
Etiget diner	5
othe diners	50
resident hall event	50

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

Activity Description	*Hours Spent (estimate)*
Robo cats	730

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)*
AWC	200
ACM	200
Robocats	520

Best wishes wrapping up the semester and in the future!

we need a class on computer careers and coding. More robots or automation.

add a pool in the new CS bulding for robotics

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Name Andrew Cilker

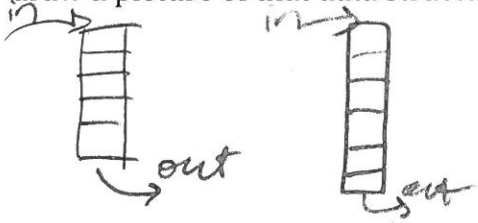
Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer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

Multiple Queues with different priority levels can model this. (First in last out) you can pull from the VIP clients queue first and regular customers after

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

If there are vip clients in queue pull from vip_queue, otherwise pull from regular_customer_queue



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

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

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

Your solution:

```
def function(input_string, input_char):
    counter = 0
    for i in range(input_string):
        if charAt(i) == input_char:
            counter = counter + 1
    return counter
```

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

2 | 2

Best case time complexity of algorithm:

$O(k)$

Explanation of best case time complexity:

The numbers added to the LL can be in the best case in descending order and smaller #s than everything in the original linked list. These will all be added immediately to the linked list

Worst case time complexity of algorithm:

$O(k \cdot n)$

$\sum_{1}^{k}$

Explanation of worst case time complexity:

In the worst case, all the #s in k are larger than all #'s in the LL so the program must iterate through the entire list.

In this case, the values in k are also in ascending order so you will also have to iterate through all the newly added values of k in the list

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

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

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: Oracle

First possible impact: Google takes new precautions with employees to prevent copying code

Second possible impact: Google takes a hit to public image and people are more incentivized to disrupt their monopoly on advertisement

Third possible impact: This could lead to more isolated development in general with companies only using their own created APIs

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: Wide-adaptation of self-driving cars could cause truck drivers to lose their jobs

Second type of harm: Edge-case situations could cause the self-driving car to hit a pedestrian.

Third type of harm: Poor system security could allow malicious hackers to cause dangerous wrecks. (increased system complexity → more potential vulnerability)

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.

Looking to find work in Bozeman, Bay area, or remote. Applied to Microsoft, twitter, Oracle as an entry level developer

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

Organization Name	*Estimate Total Hours Spent*

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

Activity Description	*Hours Spent (estimate)*

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

Name of most sophisticated version control system:

Non-trivial feature 1:

Non-trivial feature 2:

Non-trivial feature 3:

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

Activity Description	*Hours Spent (estimate)*
Tutoring in Burnard	~80

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 ciostio

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.

You could use a dictionary to map the key (urgency score) to the value (ticket), you can then access tickets based on urgency easily.

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

from existing

{key : value
....}

when you get a new ticket you can add it to your existing dictionary, perhaps if the urgency score is already in the dict add it to the ones that have the same score.

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

from new.

iterate through all tickets, add them to dict. if there are multiple of same score make an array

{100:[1,2], 200: 1 ...}

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

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

Your solution:

```
def CharInString(String1, targetChar):
    numTimes = 0
    for Char in String1:
        if(targetChar == Char):
            numTimes += 1
        else:
            continue

    return numTimes
```

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) for insertion

Explanation of best case time complexity:

Because each element is pointing to another, (heads and Tails) you can easily insert into the linked list at any point and reconnect the head to point to the tail of the one just inserted, and the new head to the next Tail.

Worst case time complexity of algorithm:

O(k) for insertion

Explanation of worst case time complexity:

Namely in an array you would have to move n elements to insert k at the correct spot, but a linked list as mentioned above you can insert wherever.

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

Organization	*Main Activities*	*Hours Spent (estimate)*
Acm	listened to speakers	~15

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

algorithms choose/weigh certain characteristics higher than others, thus creating bias when it would return.

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

It may choose a certain type of student more regularly than others based on its bias. for example weighing high school grades more than community service/projects

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:

Code would have better copyright

Second possible impact:

large companies would need to either write their own code or collaborate.

Third possible impact:

Small companies would need to go through the steps to use Java API copied 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:

harm to the driver if software malfunctioned.

Second type of harm:

harm to bystanders affected by a potential crash

Third type of harm:

harm to shareholders when the stock plummets after a serious incident

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

My one-year Plan following graduation is to get a remote software dev. position, and travel around the U.S. finding where I want to live, as well as enjoying different Places.

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

Organization Name	*Estimate Total Hours Spent*

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

Activity Description	*Hours Spent (estimate)*

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

Name of most sophisticated version control system: GitHub / Git.

Non-trivial feature 1:

- Ability To fallback commits/pushes TO retrieve lost code

Non-trivial feature 2:

- Ability to add code to new branches from Cmd line

Non-trivial feature 3:

- live-Sharing extension in VSCode That allows for you to see changes in real Time that a collaborator makes.

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)*
Projects	~50
SQL	~3

Best wishes wrapping up the semester and in the future!

Montana State University Computer Science Department

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Name Austin Coop

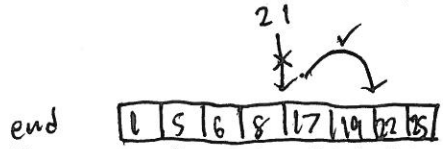
Question 1: A company uses a ticket system for customer service. Each ticket is given an urgency score when it is entered into the system. For example, a VIP customer would receive a higher urgency score than a regular customer. Assume that the urgency scores range from 1 to 10,000. The company's customer 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. Those with a higher urgency will be moved up in the queue but those with the same urgency will remain in order.

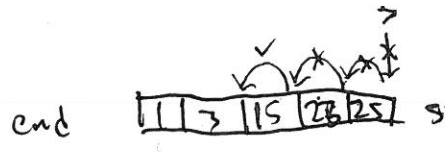
b) Describe one way in which this data structure could be implemented and draw a picture of that data structure.

Use a queue with a method that figures out where to put the number, starting at the middle of the current area and moving either up or down & repeating.



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

Use a queue and check each number from the start when inserting a number and inserting when the new number is bigger than the next or at the end.



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

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

Your solution:

```
public int occurance (String in, Char a){
    int count=0;
    for(int x=0; x< in.length; i++){
        if(in.charAt(x)==a){
            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: 1

Explanation of best case time complexity:

If each new k belongs at the front of n, you only have to search through n once for each k, or k times. Since k is a constant, that's the same as a time complexity of 1.

Worst case time complexity of algorithm: n

Explanation of worst case time complexity:

If each new value of k is greater than all current vals of n (including the last-added k value), you have to search through n values for each k, or k·n, which simplifies is the same as 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.

A programmer's bias or database's bias affecting the results of a program.

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

A database trained on a set of students from wealthy areas might have a bias against poor students.

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

Side you choose to win: Google

First possible impact:

Programmers/companies have less rights to their own code

Second possible impact:

More secrecy of code (i.e. less open source maybe)

Third possible impact:

Programmers become comfortable w/ "stealing" code

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

First type of harm:

Hitting pedestrians outside the car

Second type of harm:

Putting the driver in danger (i.e. running into a truck)

Third type of harm:

Running into buildings & damaging infrastructure

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.

Going to move back to Seattle and figure things out from there. Probably work my way up in a smaller company then try to get a better job at one of the big ones. Haven't applied any where yet (which I do realize is stupid)

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

Organization Name	*Estimate Total Hours Spent*
None	

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

Activity Description	*Hours Spent (estimate)*
None	

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

Name of most sophisticated version control system:

Don't know what that is, but probably could tell you the rest if I did.

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!

Montana State University Computer Science Department

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Name Noah Cunningham

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.

Dynamic Array, because you can easily insert and remove tickets as well as find tickets to remove

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

You could use an array of ticket objects that have various attributes.

{ Ticket_1, Ticket_2, Ticket_3... Ticket_N }

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

You could use an arry of tuples where each tuple represents the (ticket, urgency score)

{ (Ticket_1, 500), (Ticket_2, 2,000), (Ticket_3, 7000)... }

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:

```
Func1(word, letter):
    total=0
    for i in word
        if i == letter
            total = 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: $O(n)$

Explanation of best case time complexity:

if you only added 1 floating point number that was higher than all other numbers to the end of the linked list it would check if the number to its left is greater than it, and if would return false so no other checks would happen

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

Explanation of worst case time complexity:

If you added n-1 floats that were all lower than the lowest number it would have to check every float each time it would insert a float into the correct place

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

Organization	*Main Activities*	*Hours Spent (estimate)*
Valair Tech	Software Development	70 hours
ACM	Attended	2 hours
Chess Club	Attended	2 hours
Intramural BBall	Played BBall	10 hours

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

That if an algorithm is trained on 'biased' data sets that those algorithms are bias, For example facial recognition software only being trained on european descendents faces

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

If the admission software is disproportionally rejecting specific races based on the data sets it was trained with.

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:
That code could the legaly be 'stolen'

Second possible impact:
Lets companies build off others ideas to improve software

Third possible impact:
That many systems would become harder to debug becaus developers wouldnt fully understand the large code chunks they copied

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

First type of harm: Bodily Harm, injury or death to passangers

Second type of harm: Property Damage by cars crashing into things

Third type of harm: Societal harm because if someone comunits a large scale terrorist attack use self-driving software it would harm ~~them~~ society

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 secured an Internship at Volair Tech 2 months ago but the internship ended a few weeks ago when they no longer needed my help so I'm going to start applying again. In my first round of applications I secured an interview with Common Form but I already accepted to work at Volair

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

Organization Name	*Estimate Total Hours Spent*

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

Activity Description	*Hours Spent (estimate)*

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

Name of most sophisticated version control system:

Github

Non-trivial feature 1: Non-Trivial ?

Push

Non-trivial feature 2:

Pull

Non-trivial feature 3:

Merge

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

Activity Description	*Hours Spent (estimate)*
CS Talks	3
Side Projects	90

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Name PRADIPTA DASGUPTA

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

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

A hashmap could be used or a priority queue. Hashmap would have name key and value. Key would be the customer's name and value would be urgency score.

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

A hashmap is a data structure that holds data in key-value pairs.

map.put(name, value).

HashMap

KEY	VALUE
0) VIP name	0) 1,000
1) REG name	1) 2,00
2) VIP name	2) 2,500

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

map.get(name);

name returns ticket value.

A priority queue could also be used which can be implemented as a max heap tree.

* continued at the back.

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

```
private int noOfTimes(String str, char c)
{
    int count = 0; // initializing
for (int i = 0; i < str.length; i++)
{
    if (str.charAt(i) == c) // see if character exists
        count++; //increment
}

    return count; // output

}
```

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 we are adding to the front of the list then it is constant O(1) time. Unlike a doubly-linked list, we only need to connect the node to head.next. In a doubly linked list, this would be O(n) as we need to connect:

head.next;
head.prev;

Worst case time complexity of algorithm:

O(n).

Explanation of worst case time complexity:

Inserting at the end will take longer, depending on the size of the linked list. The bigger the list, the longer it will take.

time complexity will be linear time, increasing with the size 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)*
MSU STUDENT HEALTH	IT INTERN/PROGRAMMER	500+
MT WILD COLLECTIVE	MEMBER	50+
ENGINEERS WITHOUT BORDERS	MEMBER	20+

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

Algorithmic bias is code which is biased i.e code which does not take into account certain inputs which results in a unbiased output.

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

It could admit students who might not otherwise be admitted by a human. Just since the algorithm is flawed it might only look at test scores instead of the student's entire profile.

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: Restricted access to open source code

Second possible impact: more protection of closed source code. Fewer free frameworks

Third possible impact: More competition among companies harms smaller developers.

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: crash into objects.

Second type of harm: overspeed / fail to recognize speed limits.

Third type of harm: not take the car's mechanical limits into account or cause a distracted driver.

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

my plan is to work as a Software Engineer. I have applied to multiple places and currently interviewing at Sofi.

I have no plans to go to grad school.

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*
MT WILD COLLECTIVE	50+
MT OUTDOOR CLUB	20+
X COUNTRY SKI CLUB	10+

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

Activity Description	*Hours Spent (estimate)*
EGEN-310 PROJECT	20+
CSCI-447 PROJECTS	100+
WORKING AT STUDENT HEALTH	500+
WORKING AT MSU GYM	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: Git

Non-trivial feature 1: ability to clone repositories.

Non-trivial feature 2: ability to push code to a repository and fall back to a previous version if code is bugged

Non-trivial feature 3:

lets multiple people collaborate on a project. Makes code management easy.

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

Activity Description	*Hours Spent (estimate)*
LEETCODE	1000+
HACKERRANK	100+
PYTHON TUTORIALS	50+
WEB APP TUTORIALS	50+
UNITY TUTORIALS	50+

Best wishes wrapping up the semester and in the future!

Q1

max-heap = value of each internal node is greater than or equal to value of children node.

max-heap = values in order

* Question 1: A priority queue could also be used.

max-heap in array = [1000, 500, 250, 300, 900, 600, 700]
(indices 0 1 2 3 4 5 6)

left node = [2 - index]

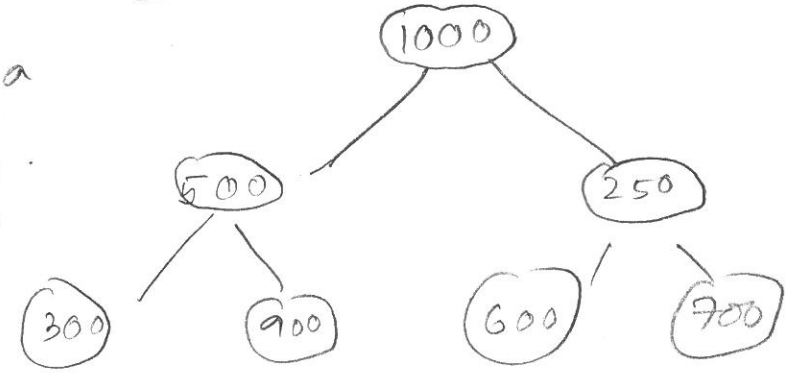
right node = [2 - index + 1]

parent = [index / 2]

Max heap is implemented as a binary tree

example, NOT a valid max-heap →

TREE IMPLEMENTATION:



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 Shreya Deb

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.

Arrays and stacks.

→ Arrays : storing the tickets into the system and calling the most urgent ticket (using pointers) and then removing them from their positions (using their address)

→ Stacks: Adding the new tickets into the array & ~~as~~ and stacking them if the memory is full

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:

```
string ch
string  s
char   ch

main ( s, ch)
    [illegible]
    input ("~~Numb~~ enter your string";s)
    ch= countcharacters(s)
```

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

Best case time complexity of algorithm:

$O(n+1)$

Explanation of best case time complexity:

- reading through the whole singly linked list takes $O(n)$ time.
- and then adding a float "k" one at a time $O(1)$

you will have to read the singly linked list everytime you enter a float.

$\therefore O(n+1)$

Worst case time complexity of algorithm:

$O(n^2)$

Explanation of worst case time complexity:

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

Organization	*Main Activities*	*Hours Spent (estimate)*
ACM	just a group member	~ 1-2 hrs
AWC	grp member went to some meetings.	~ 1-2 hrs
~~ACA~~ UCA	grading & explaining	~ 10hrs / week

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

~~bias decision formula~~
an algorithm which is biased on a particular set of rules.

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

~~→ taking in [illegible] of only a set~~

→ setting the databases into a set of commands that the admissioner would like.

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:

distrust in Oracle by the community getting sued by other more companies and having a large loss.

Second possible impact:

No more advancements in Java development [but this can be avoided by using other languages]

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:

might be able to hack into the car and cause different types of accidents. [changing sensor quality]

Second type of harm:

Changing the maps and databases of the software that may cause the company to be sued.

Third type of harm:

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

I plan to work for 3 years and then do masters. Applied in a lot of companies like oracle, snowflake and some foreign places like Japan & Australia. Sadly no luck yet in recieving an offer.

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

Organization Name	*Estimate Total Hours Spent*
Grace Bible Church	~9 hrs/week

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

Activity Description	*Hours Spent (estimate)*
Snowshoeing / Ice Skating	~2 hrs
Doing H.W together	~ 5-6 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)*
Swift (self Taught)	~23 hrs
Unity (self Taught)	~52 hrs.

Best wishes wrapping up the semester and in the future!

Thank You!!

Montana State University Computer Science Department

Graduating Senior Exam

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Name Darshan Diamond

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.

put it in an array with lowest being the highest urgency. Then compare with an if statement if index 1 is lower than index 2

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

you could use a bubble sort argorithm to sort the most urgent customers



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

You could use Dikstras Algorithm or a recursive algorith as well. I'm not sure how to draw that though.

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

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

Your solution:

```
def function (S , M)
    List L = S
int count = 0
        for i in L
            if ( i == M )
                Count += 1
        Return Count
def Main

    String  S =  James
    Char    M =  M

    function( S, M)
```

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 is it goes through the list once and is done.

Worst case time complexity of algorithm:

O_{n^2}

Explanation of worst case time complexity:

worst case is it has too many numbers to get through.

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

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

Question 5: IEEE P7003 defines the Algorithmic Bias Standard.

a) Describe briefly what algorithmic bias is.

I don't remember learning this

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

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

Side you choose to win: Oracle

First possible impact:

people will have to be careful about stealing code.

Second possible impact:

The new code may be more or less efficient

Third possible impact:

It would be hard to write some code that isn't the same as other code.

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

First type of harm:

the car could endanger the driver.

Second type of harm:

The car could hit a kid or animal if didn't see.

Third type of harm:

The car could change driving habits to get worse.

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

I plan to get any entry level job that I can do remotely. Most likley a python or Java developer. My goal is to get a job at FedEx databases, because I want to keep my health insurance with them.

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

Organization Name	*Estimate Total Hours Spent*
None	

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

Activity Description	*Hours Spent (estimate)*
None	

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

Name of most sophisticated version control system:

Not Sure

Non-trivial feature 1:

Non-trivial feature 2:

Non-trivial feature 3:

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

Activity Description	*Hours Spent (estimate)*
youtube	countless

Best wishes wrapping up the semester and in the future!