Exam 3- Requires Respondus LockDown Browser

ⓘ This is a preview of the published version of the quiz

Started: Dec 13 at 3:42pm

Quiz Instructions

Notes Regarding this Examination

- **Canvas with Respondus LockDown Browser** You must use Respondus LockDown Browser to take this examination in Canvas. You have previously been given instructions on how to download, install, and test Respondus LockDown Browser with Canvas on your own computing device (laptop, iPad, etc.).
  - If you have failed to follow those instructions previously, it is too late to follow them now. You must instead ask your instructor for a paper copy of the examination and you will incur the standard 20% late penalty for having failed to complete an assignment by the due date. (If you have previously requested a paper copy of the examination, you will be provided with a paper copy of the examination at no penalty.)
  - If you will be taking a paper copy of this examination, you must close all electronic computing devices including the one on which you are reading these instructions and place them out of sight (for example, in your pocket or backpack) for the duration of the examination. This includes but is not limited to calculators, computers, and cellular phones.
- **Open Book(s)** You may consult any printed textbooks in your immediate possession during the course of this examination.
- **Open Notes** You may consult any printed notes in your immediate possession during the course of this examination.
- **Restricted Electronic Resources** You may consult your online electronic textbook (**https://learn.zybooks.com/zybook/OUCS2413HougenFall2018** (https://learn.zybooks.com/zybook/OUCS2413HougenFall2018)), the course website (**http://www.cs.ou.edu/~hougen/classes/Fall-2018/DataStructures/** (http://www.cs.ou.edu/~hougen/classes/Fall-2018/DataStructures/)), and the files section of Canvas for this course (**$CANVAS_COURSE_REFERENCE$/files/folder/Lecture%20Slides**) using the links provided here. *You may not use other electronic resources during this exam, including but not limited to (1) following links from the approved sites to other sites in these or other domains and (2) any files stored locally on the device on which you are taking this exam.*
- **No Additional Electronic Devices Permitted** Other than the computing device on which you are completing this exam, you may not use any electronic devices during the course of this examination, including but not limited to calculators, computers, and cellular phones. All additional electronic devices in the student's possession must be turned off and placed out of sight (for example, in the student's own pocket or backpack) for the duration of the examination.
- **Violations** Copying another's work, or possession of unauthorized electronic computing or communication devices in the testing area, is cheating and grounds for penalties in accordance with school policies.

Definitions of Time and Space Complexity

Definition of Big O: Let $f(n)$ and $g(n)$ be functions mapping non-negative integers to real numbers. We say that $f(n) \in O(g(n))$ if there is a real number $c > 0$ and a fixed integer $n_0 \geq 1$ such that $f(n) \geq cg(n)$ for every integer $n \geq n_0$.

Definition of Big Ω: Let $f(n)$ and $g(n)$ be functions mapping non-negative integers to real numbers. We say that $f(n) \in \Omega(g(n))$ if there is a real number $c > 0$ and a fixed integer $n_0 \geq 1$ such that $f(n) \geq cg(n)$ for every integer n $\geq n_0$.

Definition of Big Θ: Let $f(n)$ and $g(n)$ be functions mapping non-negative integers to real numbers. We say that $f(n) \in \Theta(g(n))$ if there are real numbers c; $d > 0$ and a fixed integer $n_0 \geq 1$ such that $dg(n) \leq f(n) \leq cg(n)$ for every integer $n \geq n_0$.

Note: Recall that, if an algorithm's Big O complexity puts it in one complexity class, then that algorithm also belongs to every higher Big O complexity class. (For example, if $f(n) \in O(n^5)$, then $f(n) \in O(n^6)$, $f(n) \in O(n^7)$, etc.) For this reason, we are usually interested in an algorithm's *minimum* Big O complexity, that is, the Big O complexity class to which it belongs that provides the lowest ceiling on its performance. Similarly, if an algorithm's Big Ω complexity puts it in one complexity class, then that algorithm also belongs to every lower Big Ω complexity class. (For example, if $f(n) \in \Omega(n^5)$, then $f(n) \in \Omega(n^4)$, $f(n) \in \Omega(n^3)$, etc.) For this reason, we are usually interested in an algorithm's *maximum* Big Ω complexity, that is, the complexity class to which it belongs that provides the highest floor on its performance. If an algorithm's minimum Big O complexity class is the same as its maximum Big Ω complexity class, that complexity class is it's Big Θ complexity class.

Question 1

1.5 pts

AVL trees have a better Big Θ runtime for creation than for insertion.

- ○ True
- ○ False

Question 2

1.5 pts

AVL trees have a better minimum Big O runtime for lookup than do hash tables.

- ○ True
- ○ False

Question 3

1.5 pts

AVL trees have a better Big Θ runtime for insertion than for deletion.

- True
- False

Question 4

1.5 pts

AVL trees have a better maximum Big Ω runtime for insertion than do hash tables.

- True
- False

Question 5

1.5 pts

AVL trees have a better Big Θ runtime for insertion than do max heaps.

- True
- False

Question 6

1.5 pts

AVL trees have a better Big Θ runtime for lookup than do linked lists.

- True
- False

Question 7

1.5 pts

AVL trees have a better Big Θ runtime for deletion than do double-ended heaps (deaps).

- True
- False

Question 8

1.5 pts

AVL trees have a better Big Θ runtime for insertion than do 2-3 trees.

- True
- False

Question 9

1.5 pts

AVL trees have a better Big Θ runtime for insertion than do sorted arrays.

- True
- False

Question 10

1.5 pts

AVL trees have a better Big Θ runtime for lookup than for deletion.

- True
- False

Question 11

1.5 pts

AVL trees have a better Big Θ runtime for lookup than do sorted arrays.

- True
- False

Question 12

1.5 pts

AVL trees have a better Big Θ runtime for deletion than do red-black trees.

- True
- False

Question 13

3 pts

Remove on a max heap always returns which value from the tree?

- The value found in either the root node's left child or its right child, whichever contains the smaller key.
- The value found in the rightmost leaf node on the deepest level of the tree when remove is called.
- The value found in either the root node's left child or its right child, whichever contains the larger key.
- The value found in the root node when remove is called.
- The value found in the leftmost leaf node on the deepest level of the tree when remove is called.

Question 14

3 pts

The Big Θ runtime complexity of inserting *n* elements in an AVL tree is which of the following?

- n log n
- 1
- n
- log n
- n * n (that is, n squared)

Question 15

3 pts

The Big Θ runtime complexity of rebalancing an AVL tree after a deletion is which of the following?

- n log n
- 1
- n * n (that is, n squared)
- 2 ^ n (that is, 2 to the power n)
- n

Question 16

3 pts

The Big Θ runtime complexity of rebalancing an AVL tree after an insertion is which of the following?

- 1
- n
- n * n (that is, n squared)
- n log n
- 2 ^ n (that is, 2 to the power n)

Question 17

3 pts

The Big Θ runtime complexity for sorting *n* items using heap sort is which of the following?

- log n
- n
- 2 ^ n (that is, 2 to the power n)
- n log n
- n * n (that is, n squared)

Question 18

3 pts

Insert on a max heap always adds a node to the tree at which location?

- To the immediate right of the rightmost leaf node on the deepest level of the tree.
- Either the root node's left child or its right child, whichever contains the larger key.
- To the left of the leftmost leaf node on the deepest level of the tree.
- The root node.
- Either the root node's left child or its right child, whichever contains the smaller key.

Question 19

3 pts

The Big Θ runtime complexity of finding an element in an AVL tree of *n* items is which of the following?

- log n

- n
- n log n
- n * n (that is, n squared)
- 1

Question 20

3 pts

Remove on a max heap always removes which node in the tree?

- The rightmost leaf node on the deepest level of the tree.
- The leftmost leaf node on the deepest level.
- Either the root node's left child or its right child, whichever contains the smaller key.
- Either the root node's left child or its right child, whichever contains the larger key.
- The root node.

Question 21

3 pts

The Big Θ runtime complexity of deleting *n* elements from an AVL tree is which of the following?

- n
- 1
- n log n
- n * n (that is, n squared)
- log n

Question 22

5 pts

Match each algorithm with the best description of how it functions.

Merge sort	**Finds the element that goes at each index by searching through the unsorted elements.**
Heap sort	**Uses the digits of the elements' keys to place them in order rather than direct key comparisons.**
Quick sort	**Allocates additional memory on the heap for each successive element until they're all there in order.**
Insertion sort	**Places each element where it belongs, while ensuring the items on each side of it belong on that side.**
Radix sort	**Places each element where it belongs relative to the elements that have already been sorted.**
	Uses queues to always sorts the data more quickly than other methods.
	Merges unsorted lists together to make a sorted list.
	Places the elements into a priority tree, then pulls them out in order.
	Splits the data down to the individual elements, then recombines them in order.
	Moves each element into place by comparing successive neighbors and swapping them if they're out of order.

Question 23

5 pts

Match each data structure with the best description of its strengths relative to other data structures.

AVL tree.	Constant time performance for all functions (insertion, deletion, lookup).
Hashing.	Always has the fastest insertion time.
Resizable array.	Usually the fastest performance for all functions (insertion, deletion, lookup).
Linked list.	Consistent performance for all functions (insertion, deletion, lookup).
Max (or min) heap.	Can be resized to accommodate more data.
	Flexible uses (queues, stacks, etc.) without requiring contiguous memory.
	Is a primitive C++ data type.
	Efficient for priority-based applications.
	Never runs out of memory.
	Can be easily sorted based on different criteria.
	Never causes memory leaks.

Question 24

5 pts

Match each term with the best description of it.

Leaf	
Root	
Branch	
Node	
Edge	

The base or starting node of a tree.
The node in the tree with the largest value.
A node at the deepest level in a tree.
A vertex containing one or more keys and possibly connected by edges.
A split in the table that separates it into equal halves.
An edge connecting two nodes in a tree.
A node in the tree with either a right or left child but not both.
A connection between two nodes in a tree or graph.
The nodes on the far left or right of the tree.
A terminal node in a tree.

Question 25

5 pts

Match each condition in the AVL tree rebalance function with the appropriate action/function to call. (Note that this question follows the convention that positive diff values indicate greater depth on the right while negative diff values indicate greater depth on the left.)

-2 < diff < 2	
-2 at this, 1 at left child	
-2 at this, -1 at left child	
2 at this, 1 at right child	

Return.
Right rotation on this.
Left rotation on this.
Right rotation on this followed by right rotation on right child.
Right rotation on this followed by left rotation on right child.
Left rotation on this followed by right rotation on right child.
Left rotation on this followed by left rotation on right child.
Right rotation on this followed by right rotation on left child.
Right rotation on this followed by left rotation on left child.
Right rotation on right child followed by right rotation on this.
Right rotation on right child followed by left rotation on this.
Right rotation on left child followed by left rotation on this.
Left rotation on this followed by right rotation on left child.
Left rotation on this followed by left rotation on left child.
Left rotation on left child followed by left rotation on this.
Left rotation on left child followed by right rotation on this.
Left rotation on right child followed by right rotation on this.

[Choose]

2 at this, -1 at right child [Choose]

Question 26

5 pts

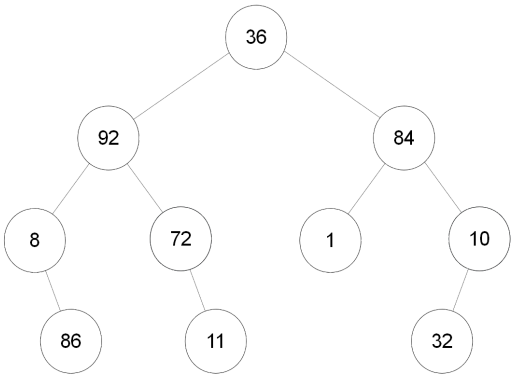
Match each data structure with the best description of it.

Tree	A tree in which each interior node has either one key with two branches or two keys with three branches. A data structure consisting of nodes, each of which has exactly two bidirectional edges. A tree in which each node has, at most, two edges. A tree in which each node has exactly two edges. A tree in which the key in each node has a higher value than its children. A binary search tree that is always full. A binary tree in which the keys in the nodes are ordered with lower values on one side and high values on the other. A data structure consisting of nodes with edges connecting them in a layered structure. A tree in which each node has either two or three keys. A binary search tree in which the difference in height between the left and right branches is never allowed to exceed one at any given node.
Binary tree	
Binary search tree	
AVL tree	
2-3 tree	

Question 27

5 pts

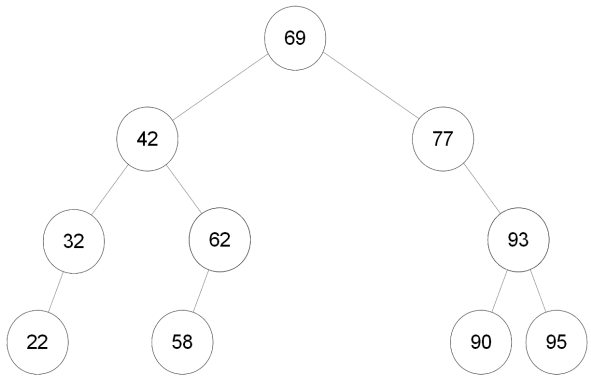
Give the pre-order traversal for the following tree.



Question 28

5 pts

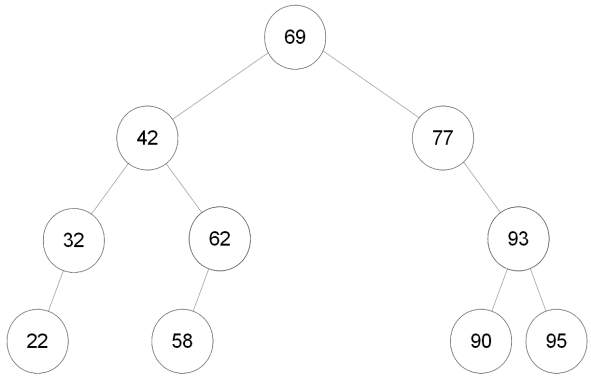
List, in order, the keys that need to be compared to key 56 to perform a search for that key in the given binary search tree. (If there are any blanks below that are not used after all necessary comparisons are made, fill those in with the word "blank.")



Question 29

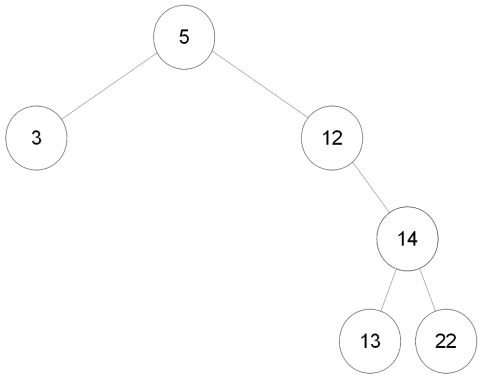
5 pts

List, in order, the keys that need to be compared to key 93 to perform a search for that key in the given binary search tree. (If there are any blanks below that are not used after all necessary comparisons are made, fill those in with the word "blank.")



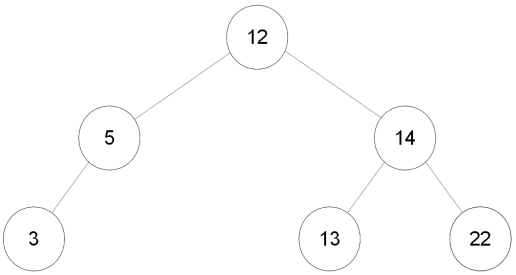
Question 30

4 pts

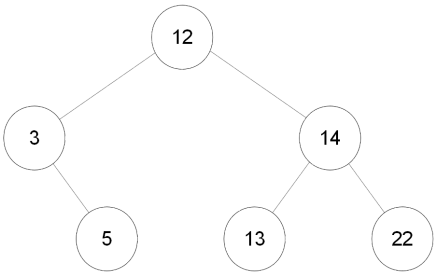


What is the result of performing a zag operation on the node with key 12 in the tree above?

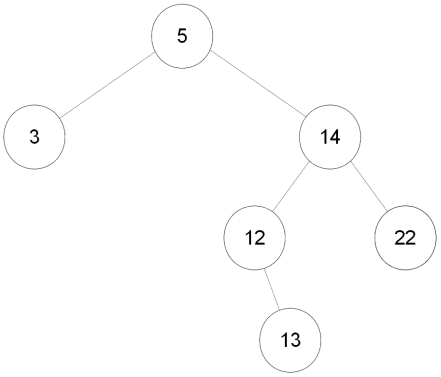
A.



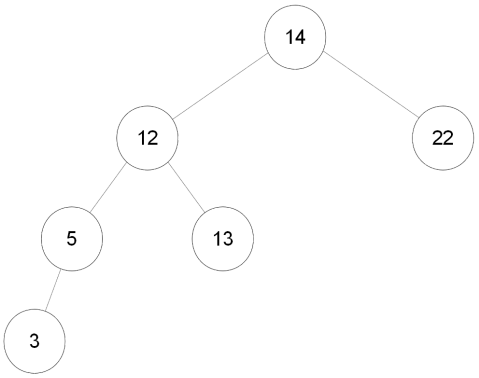
B.



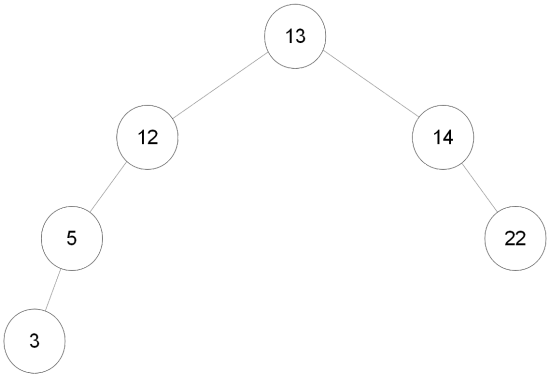
C.



D.

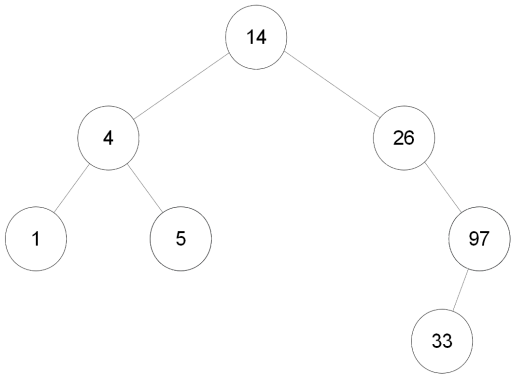


E.



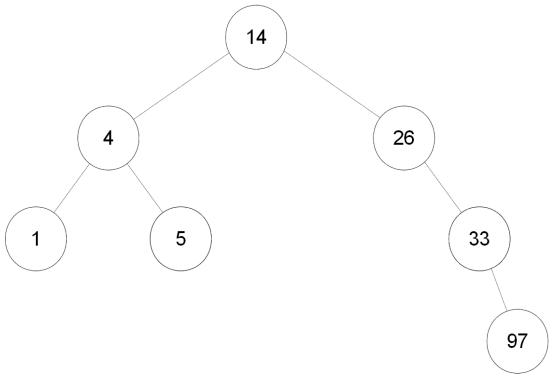
Question 31

6 pts

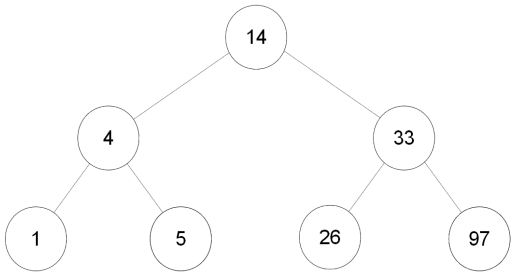


What is the result of performing a zigzag operation on the node with key 26 in the tree above?

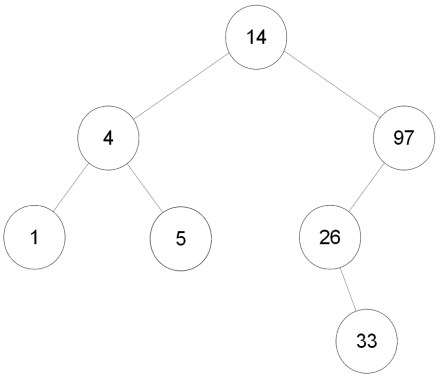
A.



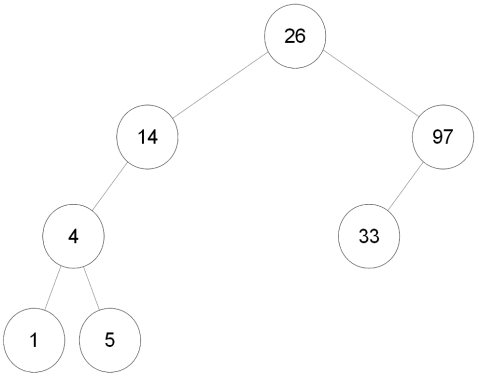
B.



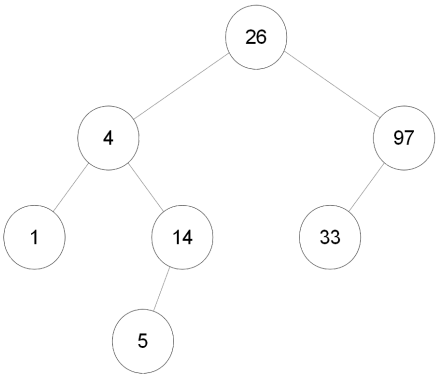
C.



D.



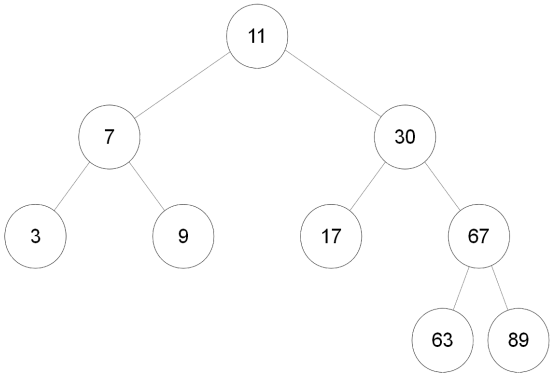
E.



Question 32

1 pts

Where would an item with key 96 be added to the following binary search tree?

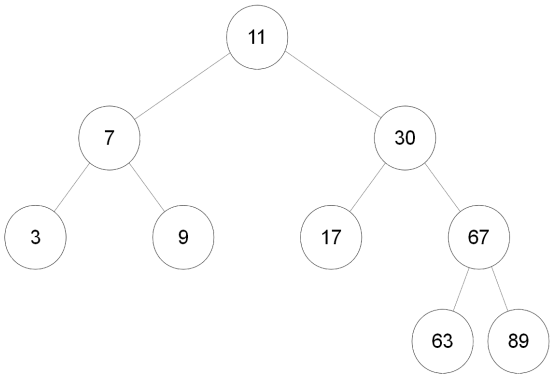


- As the right child of 63.
- As the left child of 63.
- As the right child of 89.
- As the root of the tree.
- As the left child of 89.

Question 33

2 pts

Give the diff value of each node in the following AVL tree after an item with key 96 is added to it but before any rebalancing operations are performed on it. (Note that this question follows the convention that positive diff values indicate greater depth on the right while negative diff values indicate greater depth on the left.)



11:

7:

3:

9;

30:

17:

67:

63:

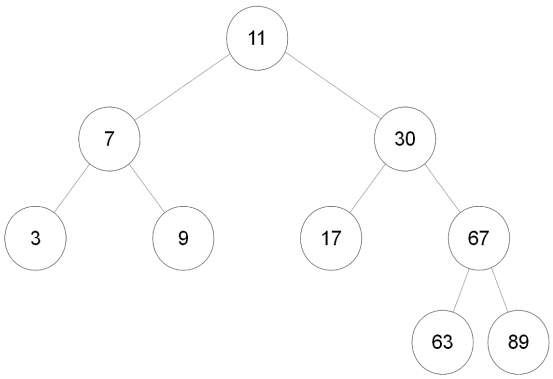
89:

96:

Question 34

2 pts

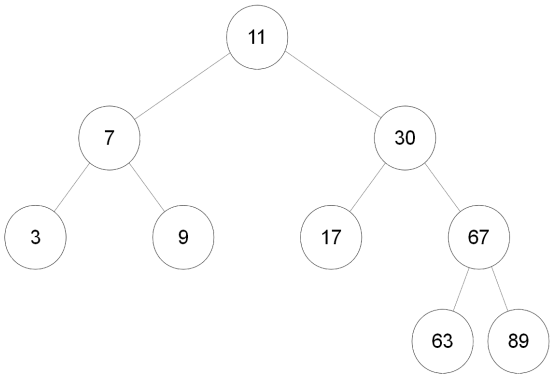
Starting from the following AVL tree, after an item with key 96 is added to it but before any rebalancing operations are performed on it, which description most accurately describes its balance?



- Outside right heavy.
- Outside left heavy.
- Inside left heavy.
- Balanced.
- Inside right heavy.

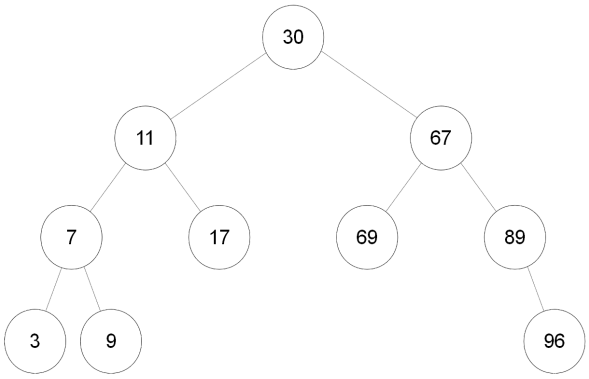
Question 35

10 pts

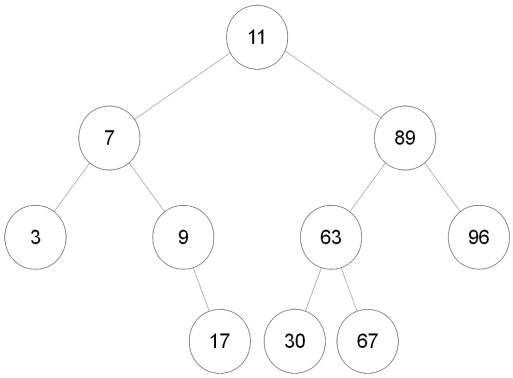


What is the result of adding a data item with key 96 to the AVL tree above?

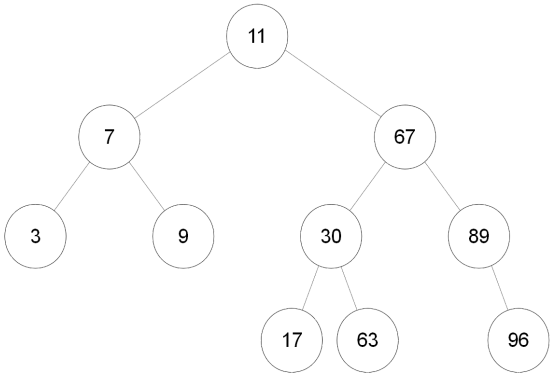
A.


30
11
67
7
17
69
89
3
9
96

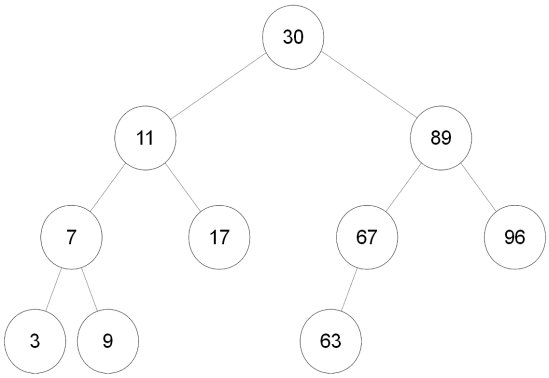
B.


11
7
89
3
9
63
96
17
30
67

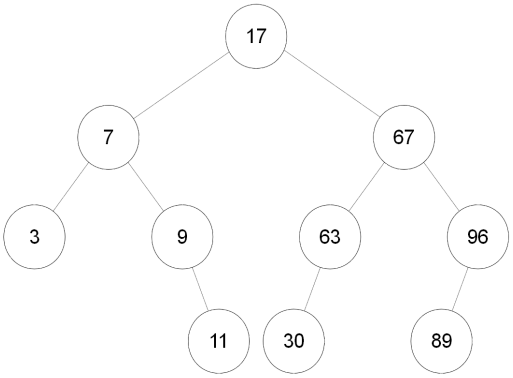
C.


11
7
67
3
9
30
89
17
63
96

D.

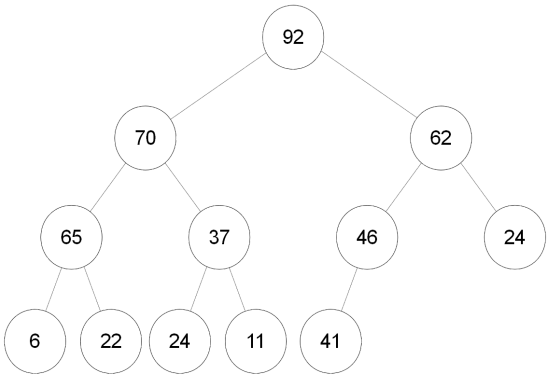

30
11
89
7
17
67
96
3
9
63

E.



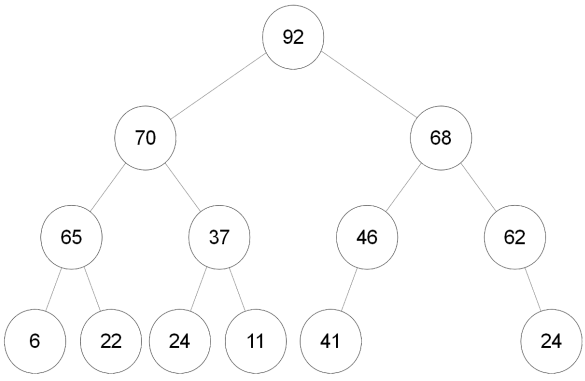
Question 36

5 pts

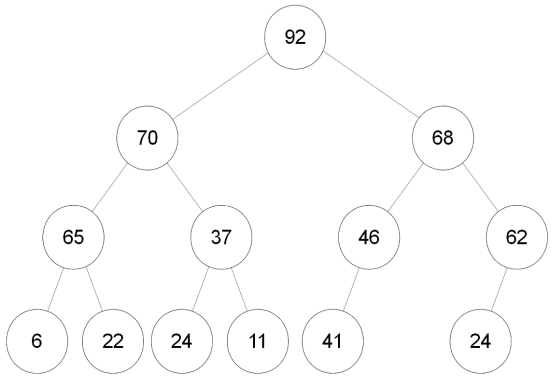


What is the result of adding an item with key 68 to the Max Heap above?

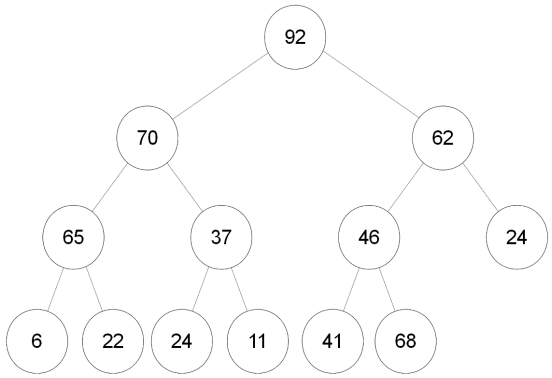
A.



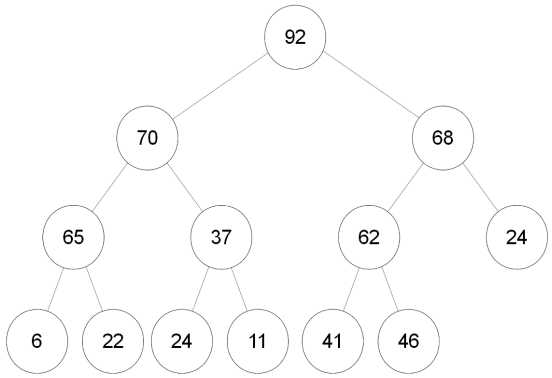
B.


92
70
68
65
37
46
62
6
22
24
11
41
24

C.


92
70
62
65
37
46
24
6
22
24
11
41
68

D.


92
70
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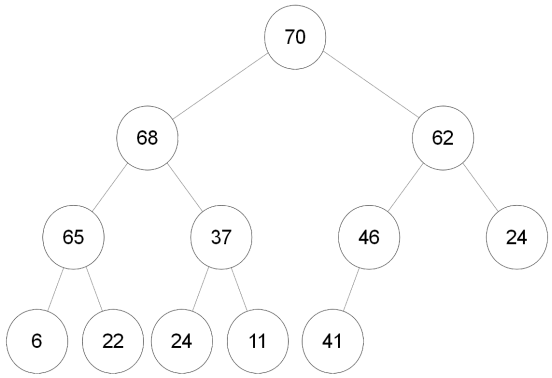
46

E.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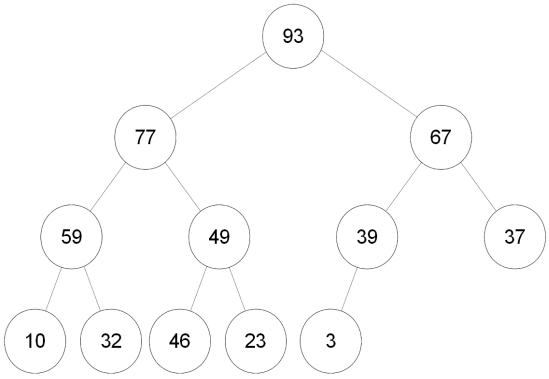
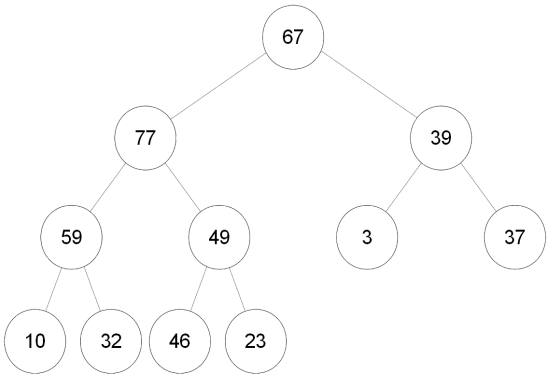
Question 37

5 pts

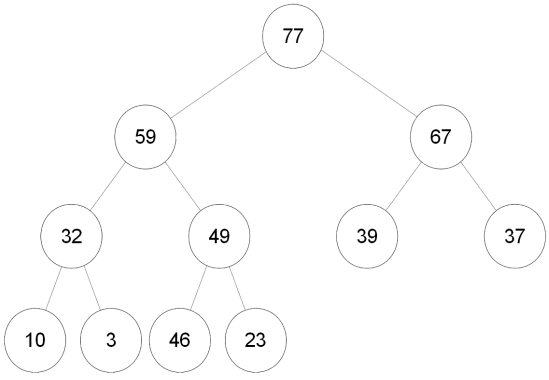


What is the result of removing the next item from the Max Heap above?

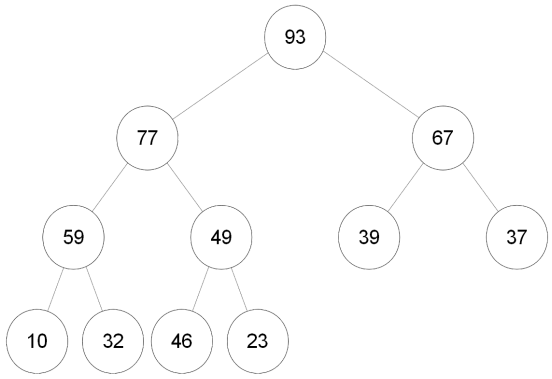
A.



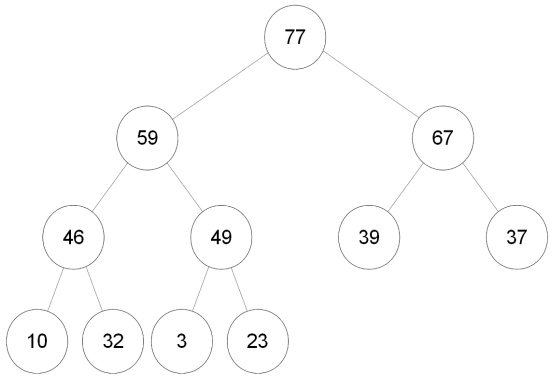
B.



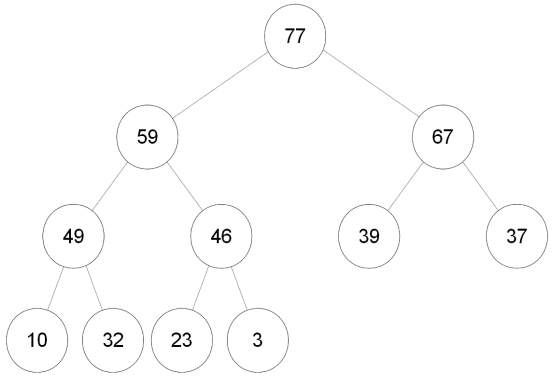
C.



D.



E.



Ethics Scenario

(*The remaining questions in this exam refer to the following hypothetical scenario.*)

Another day, another meaningless set of tasks. It wasn't supposed to be like this.

When Alessandro went into computer science, he was excited by the technology and the chance to make computers do things simply by writing programs. Yet, here he was, cranking through yet another task list Judith (his boss) had given him with no sense of excitement, no sense of accomplishment, not even a real understanding of what he was doing, just meaningless drudgery.

Connect here. Upload this. Encrypt that. Delete those. Whatever. It was all just filenames of garbled characters and IP addresses.

Worst of all was all of the logging. Alessandro hated the logging—noting in his spreadsheet at which tasks he was successful, and at which he had failed. So many refused connections! So many invalid passwords! So many sessions closed in the middle! So many failures!

Still, Judith had promised him that if he just did what he was told and kept his head down, things would improve. They'd hired him for his excellent coding skills and they meant to put those to use, as soon as he showed that he was part of the team.

So, Alessandro would show his team membership, at least for another day and another set of tasks, whatever they were. *Sigh*.

Question 38

2 pts

Which of the following is the most likely motivation for Alessandro's violation of one of the ethical principles above?

- Alessandro is angry and hates his job
- Alessandro is feeling rushed for time
- Alessandro doesn't know Judith
- Alessandro is determined to progress in his job
- Alessandro is illiterate

Question 39

2 pts

Which of the following is an ethical-decision-making strategy that Alessandro could have employed to improve his ethical decision making?

- He could have weighed the benefits to him against the harms to Judith
- He could have familiarized himself with ethical guidelines related to his discipline
- He could have asked for more time to complete his tasks
- He could have decided to respect other people's property
- He could have insisted that he be given a coding job, since that is what he's good at

Question 40

2 pts

Which of the following is an ethical-decision-making strategy that Alessandro could have employed to improve his ethical decision making?

- He could have realized that there are no perfect solutions
- He could have remained objective
- He could have considered consequences for himself or others
- He could have asked for a raise
- He could have taken a job with a different company

Question 41

2 pts

Of the following ethical principles from the ACM Code of Ethics, which has Alessandro most likely violated in this scenario?

- Accept and provide appropriate professional review
- Access computing and communication resources only when authorized or when compelled by the public good
- Manage personnel and resources to enhance the quality of working life
- Give comprehensive and thorough evaluations of computer systems and their impacts, including analysis of possible risks

- Maintain high standards of professional competence

Question 42

2 pts

Which entity is most likely to benefit from Alessandro's actions in the short run?

- Judith, because Alessandro is doing what he is told
- The company Alessandro works for, because they've been getting the benefit of Alessandro's coding skills
- All of the entities mentioned in the other answers, for the reasons they each give
- Alessandro, because he's learning valuable technical skills
- The owners of the computers to which Alessandro is connecting because they are getting the benefit of his services

Question 43

2 pts

Of the following ethical principles from the IEEE Code of Ethics, which has Alessandro most likely violated in this scenario?

- to improve the understanding by individuals and society of the capabilities and societal implications of conventional and emerging technologies, including intelligent systems
- to seek, accept, and offer honest criticism of technical work, to acknowledge and correct errors, and to credit properly the contributions of others
- to hold paramount the safety, health, and welfare of the public, to strive to comply with ethical design and sustainable development practices, and to disclose promptly factors that might endanger the public or the environment
- to avoid real or perceived conflicts of interest whenever possible, and to disclose them to affected parties when they do exist
- to reject bribery in all its forms

Question 44

2 pts

Which of the following is an ethical-decision-making problem (interfering factor) that is most likely to have contributed to at least one of Alessandro's decisions?

- He chose the rule/principal that promotes themselves rather than thinking about the needs and concerns of others
- He engaged in binary thinking
- He was unaware of his own biases
- He failed to identify long term consequences
- He made hasty decisions

Question 45

2 pts

Which of the following is the most likely reason for Alessandro's violation of one of the ethical principles above?

- Alessandro wants to demonstrate loyalty
- Alessandro likes busy work
- Alessandro is driven to work hard
- Alessandro doesn't read software license agreements
- Alessandro doesn't care about intellectual property

Question 46

2 pts

Of the following laws, which has Alessandro most likely violated in this scenario?

- None of the other answers

- The Universal Declaration of Human Rights (UDHR)
- The United States Constitution
- The PATRIOT Act
- The Computer Fraud and Abuse Act (CFAA)

Question 47

2 pts

Of the following ethical principles from the ACM Code of Ethics, which has Alessandro most likely violated in this scenario?

- Be fair and take action not to discriminate
- Respect the work required to produce new ideas, inventions, creative works, and computing artifacts
- Avoid harm
- Honor confidentiality
- Respect privacy

Question 48

2 pts

Which type of cyber-related crime did Alessandro possibly commit?

- Cyber vandalism
- Cyber terrorism
- All of the individual types listed
- Cyber trespassing
- None of the individual types listed

Question 49

2 pts

Which entity is likely to be harmed by Alessandro's actions in the long run?

- Alessandro's company, because Alessandro's actions may be illegal
- All of the entities mentioned in the other answers, for the reasons they each give
- None of the entities mentioned in the other answers
- Alessandro, because his actions may be illegal
- Judith, because Alessandro's actions may be illegal and she assigned these tasks to him

Question 50

2 pts

Which of the following is an ethical-decision-making problem (interfering factor) that is most likely to have contributed to at least one of Alessandro's decisions?

- He violated his employee agreement by not writing code
- He acted out of habit rather than considering his ethical situation
- He was subjective and allowed strong feelings to inhibit his decision making
- He failed to identify hidden motives or agendas of involved parties and their decisions' implications for each of these parties
- He broke the law by using a computing system in an unauthorized way

Question 51

2 pts

Of the following ethical principals from the joint ACM/IEEE Software Engineering Code of Ethics, which has Alessandro most likely violated in this scenario?

- Accept no outside work detrimental to the work they perform for their primary employer

- Consider issues of physical disabilities, allocation of resources, economic disadvantage and other factors that can diminish access to the benefits of software
- Software engineers shall be fair to and supportive of their colleagues
- Use the property of a client or employer only in ways properly authorized, and with the client's or employer's knowledge and consent
- Software engineers shall act consistently with the public interest

Question 52

2 pts

Of the following ethical principles from the IEEE Code of Ethics, which has *Judith* most likely violated in this scenario?

- to seek, accept, and offer honest criticism of technical work, to acknowledge and correct errors, and to credit properly the contributions of others
- to improve the understanding by individuals and society of the capabilities and societal implications of conventional and emerging technologies, including intelligent systems
- to assist colleagues and co-workers in their professional development and to support them in following this code of ethics
- to treat fairly all persons and to not engage in acts of discrimination based on race, religion, gender, disability, age, national origin, sexual orientation, gender identity, or gender expression
- to avoid real or perceived conflicts of interest whenever possible, and to disclose them to affected parties when they do exist

Quiz saved at 3:42pm Submit Quiz