Who wants to be a millionaire Computer Scientist?

Preparation for the finals
Game 2
Question 1. 500 points

• Identify the code which does not run in time $O(1)$

A.  
for (i = 0; i < 10; i++)  
    sum += num2;

B.  
if (x > y)  
    return x;

C.  
    i = 0;  
    while (i < listSize) {  
        sum = sum + 1;  
        i++;  
    }

D.  
    num = arr[i];  
    arr[i + 1] = num + 1;
Question 1. 500 points

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C. 
i = 0;
while (i < listSize) {
    sum = sum + i;
    i++;
}

D. 
num = arr[i];
arr[i + 1] = num + 1;

The correct answer is C.
Question 2. 1,000 points

• Which of the following is an example of constant time $O(1)$?

A. Finding the minimum value of an array
B. Binary search
C. Accessing an element of an array
D. Bubble sort
Question 2. 1,000 points

• Which of the following is an example of constant time $O(1)$?

A. Finding the minimum value of an array
B. Binary search
C. Accessing an element of an array
D. Bubble sort

The correct answer is C.
Question 3. 2,000 points

• What is the complexity of *heapsort*?

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<table>
<thead>
<tr>
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<tbody>
<tr>
<td>A</td>
<td>O (n)</td>
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<tr>
<td>B</td>
<td>O (n log n)</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>O (log n)</td>
<td></td>
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<tr>
<td>D</td>
<td>O (n^2)</td>
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</tbody>
</table>
The correct answer is B.
ListTraverseReverse must print a linked list in reverse order. Which XXX should replace the missing statement?

ListTraverseReverse(list) {
    XXX
}

printReverse(node) {
    if (node is not null) {
        printReverse(node→next)
        print node
    }
}

A. printReverse(list→head)
B. printReverse(list)
C. printReverse(list→head→next)
D. printReverse(list→tail)
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  XXX
}

printReverse(node) {
  if (node is not null) {
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    print node
  }
}

A. printReverse(list→head)
B. printReverse(list)
C. printReverse(list→head→next)
D. printReverse(list→tail)

The correct answer is A.
Question 5. 5000 points

• The algorithm performs exactly $7+12N+3N^2$ steps. What is the Big O of this algorithm?

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<tbody>
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<td>B</td>
<td>$N^3$</td>
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<td>C</td>
<td>$N^2$</td>
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<td>$N^2$</td>
</tr>
<tr>
<td>D</td>
<td>$12N$</td>
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The correct answer is C.
Checkpoint 1 reached!

You have 5,000 points
• Which of the following is an AVL tree?
• Which of the following is an AVL tree?

A

B

C

D

The correct answer is C.
• Which of the following is TRUE?

A. The cost of searching a binary search tree is $O(\log n)$ and that of an AVL tree is $O(n)$
B. The cost of searching a binary search tree is $O(n)$ and that of an AVL tree is $O(\log n)$
C. The cost of searching a binary search tree is $O(\log n)$ and that of an AVL tree is $O(\log n)$
D. The cost of searching a binary search tree is $O(n)$ and that of an AVL tree is $O(n)$
Question 7. 10,000 points

• Which of the following is TRUE?

A. The cost of searching a binary search tree is \(O(\log n)\) and that of an AVL tree is \(O(n)\)
B. The cost of searching a binary search tree is \(O(n)\) and that of an AVL tree is \(O(\log n)\)
C. The cost of searching a binary search tree is \(O(\log n)\) and that of an AVL tree is \(O(\log n)\)
D. The cost of searching a binary search tree is \(O(n)\) and that of an AVL tree is \(O(n)\)

The correct answer is B.
Question 8. 15,000 points

Which is an Abstract data type (ADT)?

<table>
<thead>
<tr>
<th></th>
<th>Linked List</th>
<th>Stack</th>
<th>Adjacency matrix</th>
<th>None of the above</th>
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</thead>
<tbody>
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<td>A</td>
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</tbody>
</table>
Question 8. 15,000 points

• Which is an Abstract data type (ADT)?

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<td>Stack</td>
<td></td>
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<tr>
<td>C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>None of the above</td>
<td></td>
</tr>
</tbody>
</table>

The correct answer is B.
What is the result of rebalancing the following AVL tree?
Question 9. 25,000 points

• What is the result of rebalancing the following AVL tree?

The correct answer is B.
• If the `binarySearch()` method is called to search a sorted array of 32 numbers, then at most _____ array numbers are compared against the search key.
Question 10. 50,000 points

• If the `binarySearch()` method is called to search a sorted array of 32 numbers, then at most _____ array numbers are compared against the search key.

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<tbody>
<tr>
<td>A</td>
<td>6</td>
</tr>
<tr>
<td>B</td>
<td>32</td>
</tr>
<tr>
<td>C</td>
<td>4</td>
</tr>
<tr>
<td>D</td>
<td>5</td>
</tr>
</tbody>
</table>

The correct answer is D.
Checkpoint 2 reached!
You have 50,000 points
• Which **XXX** completes the *append*() method in the Java LinkedList class for a singly-linked list?

```java
public void append(Node newNode) {
    if (head == null) {
        head = newNode;
        tail = newNode;
    } else {
        XXX
        tail = newNode;
    }
}
```

A. head.next = newNode;
B. head = newNode;
C. tail.next = newNode;
D. head = tail;

**Question 11. 75,000 points**
Question 11. 75,000 points

• Which **XXX** completes the *append()* method in the Java LinkedList class for a singly-linked list?

```java
public void append(Node newNode) {
    if (head == null) {
        head = newNode;
        tail = newNode;
    } else {
        XXX
        tail = newNode;
    }
}
```

A. head.next = newNode;
B. head = newNode;
C. tail.next = newNode;
D. head = tail;

**The correct answer is C.**
• What is the height of a BST built by inserting nodes in the order 12, 24, 23, 48, 47?
What is the height of a BST built by inserting nodes in the order 12, 24, 23, 48, 47?

The correct answer is B.
Question 13. 250,000 points

Identify the AVL tree which results after insertion of node 9 into the following tree:

A.  
```
    5
   /|
  4 7
 /  |
8  9
```

B.  
```
    5
   /|
  4 8
 /  |
7  9
```

C.  
```
    8
   /|
  5 9
 /  |
4 7
```

D.  
```
    7
   /|
  5 8
 /  |
4 9
```
Question 13. 250,000 points

• Identify the AVL tree which results after insertion of node 9 into the following tree:

A

B

C

D

The correct answer is B.
Question 14. 500,000 points

- The queue was implemented using a circular array.
- What is the condition **XXX**?

```python
enqueue(element, Array A, read, write)
    if XXX
        print ("Queue is full")
    return
    A[write] = element
    write = (write+1) % A.length
```

A. write == read
B. write == (read + 1) % A.length
C. write == (read – 1) % A.length
D. write == read - 1
Question 14. 500,000 points

- The queue was implemented using a circular array.
- What is the condition \textbf{XXX}?

\begin{verbatim}
enqueue(element, Array A, read, write)
    if XXX
        print ("Queue is full")
    return
    A[write] = element
    write = (write+1) % A.length
\end{verbatim}

A. \texttt{write == read}
B. \texttt{write == (read + 1) % A.length}
C. \texttt{write == (read - 1) % A.length}
D. \texttt{write == read - 1}

\textbf{The correct answer is C.}
Question 15. **One million points!**

- Identify the rebalanced AVL tree after removing 60 from the following tree:
Question 15. One million points!

- Identify the rebalanced AVL tree after removing 60 from the following tree:

The correct answer is C.
Well done!

You are almost ready for the final exam