CSE 143: Computer Programming II — Spring 2015

Final Review — Adam Blank

Studying

Do many questions on Practice-It! **First, write your solution down on paper. Then, debug it by hand. Finally, type it into Practice-It! to see what you got wrong.**

Question Types

The following types of questions *will* appear on the exam

Binary Search Tree Insertion

Given a set of values, add them to a binary search tree.

Binary Tree Traversal

Perform traversals in the three standard orders on a tree.

Polymorphism Mystery

Given a set of classes with inheritance relationships, a set of variables declared using those classes, and a set of method calls made on those variables, determine the output.

Just like the lecture/section.

Collections Mystery

Given some collections code (it will involve a map), write the output.

Comparable Programming

Write a complete class and make it `Comparable` based on a given set of comparison criteria.

No inheritence in this question.

(Easier) Binary Tree Programming

Add a method to the `IntTree` class from lecture.

This would be *using* the tree

(Harder) Binary Tree Programming

Add a method to the `IntTree` class from lecture

Modifying or *Building* a tree

Linked List Programming

Add a method to the `LinkedIntList` class from lecture.

Make sure you are comfortable with `LinkedLists`!

Untested Topics

The following topics will *definitely* not appear on the exam

2-D arrays	Detailed Knowledge of Big-Oh	Searching and Sorting Algorithms
Recursive Backtracking	Catching Exceptions	Priority Queues
Huffman Coding	IO Streams	Abstract/Inner Classes
Hashing	Implementing Iterators	Implementing a "generic" class
Programming with inheritance	Writing an interface	

Linked Lists

Write a method called `moveSecondToLastToFront` that rearranges the order of a list of integers so that the *second to last* element of the list appears at the front. For example, if a variable called `list` stores these values:

Don't forget to read the damn question...

```
[0, 1, 2, 3, 4, 5, 6, 7, 8, 9]
```

and you make the call `list.moveSecondToLastToFront()`, the list should be the following:

```
[8, 0, 1, 2, 3, 4, 5, 6, 7, 9]
```

If the list has fewer than two elements, it should be unchanged by a call to `moveSecondToLastToFront`. You are writing a method that will become part of the `LinkedIntList` class. You may define private helper methods to solve this problem, but, otherwise, you may not assume that any particular methods are available.

and to put it in the class. *NO STATIC*

You are allowed to define your own variables of type `ListNode`, but you may not construct any new nodes, and you may not use any auxiliary data structure to solve this problem (no array, ArrayList, stack, queue, String, etc). You also may not change any data fields of the nodes. You MUST solve this problem by rearranging the links of the list. Your solution must run in $\mathcal{O}(n)$ time where n is the length of the list.

Most questions will disallow extra structures. Pay attention to this!

```
public class ListNode {
   public final int data; // data stored in this node
   public ListNode next; // link to next node in the list
   public ListNode(int data) { ... }
   public ListNode(int data, ListNode next) { ... }

}
public class LinkedIntList {
   private ListNode front;









}
```

Binary Trees

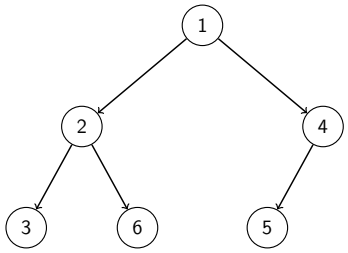
Write a method called `specialSumTree` for a binary tree of integers. The method should return the sum of all the integers in the tree augmented in the following way:

- Even numbers should be counted normally
- Odd numbers should be counted twice

Figure out the return type. And make a private method. And... read the question

For example, if a variable `tree` stores a reference to the following tree:

Did you draw any pictures on the last question? If not, you're doing it wrong. :(



then the call `tree.specialSumTree()` should return $1 + 1 + 2 + 3 + 3 + 6 + 4 + 5 + 5 = 30$.

You are writing a public method for a binary tree class defined as follows:
You may define private helper methods to solve this problem, but, otherwise, you may not call any other methods of the class. You may not define any auxiliary data structures to solve this problem.

Did you draw pictures for **THIS** question yet? C'mon...

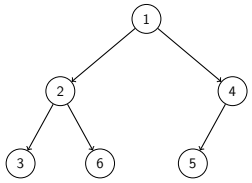
```
public class IntTreeNode {
   public final int data; // data stored in this node
   public IntTreeNode left; // reference to left subtree
   public IntTreeNode right; // reference to right subtree
   public IntTreeNode(int data) { ... }
   public IntTreeNode(int data, IntTreeNode left) { ... }
   public IntTreeNode(int data, IntTreeNode left, IntTreeNode right) { ... }
}
public class IntTree {
   private IntTreeNode root;
```

}

Binary Trees

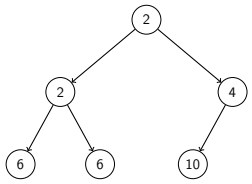
Write a method called `makeEvenTree` for a binary tree of integers. The method should replace all the odd values in the tree with their twice their value. For example, if a variable `tree` stores a reference to the following tree:

When we draw you a picture, make sure you understand it.



then, after the call `tree.makeEvenTree()`, `tree` should store a reference to the following tree:

Be lazy. Use simple examples. Empty tree? Tree with ONE node... Maybe three nodes if you're feeling adventurous.



You are writing a public method for a binary tree class defined as follows:

You may define private helper methods to solve this problem, but, otherwise, you may not call any other methods of the class. You may not define any auxiliary data structures to solve this problem.

and by "may", we mean, you probably should...

```
public class IntTreeNode {
   public final int data; // data stored in this node
   public IntTreeNode left; // reference to left subtree
   public IntTreeNode right; // reference to right subtree
   public IntTreeNode(int data) { ... }
   public IntTreeNode(int data, IntTreeNode left) { ... }
   public IntTreeNode(int data, IntTreeNode left, IntTreeNode right) { ... }
}
public class IntTree {
   private IntTreeNode root;
```

```
}
```