Midterm Study Guide

Logistics

- Wednesday, October 11th @ 3:10 PM in Romney Hall 008
- Time length: 50 minutes. We will try to start the exam at 3:05 .This exam is designed to be completed in 35-40 minutes (hopefully).
- Open notes. You are allowed to use your laptop, your IDE, any notes, slides, lecture examples. This exam can be completed without a laptop.
- You are NOT allowed to use the internet to access external resources (Google, Stack Overflow, W3 Schools, etc)
- The midterm exam will consist of different types of question, such as:
 - Multiple choice questions
 - True/False
 - Short answer
 - What is wrong with this code?
 - $\circ~$ What is the difference between X and Y
 - Write some code so that X happens.

Content

The following topics are all fair game for the midterm exam.

- Basic Java Classes, OOP
- Operations and variables
- Methods
- If statements
- Loops
- Arrays
- Inheritance
- References
- Static Methods
- Abstract Classes, Interfaces
- Polymorphism
- ArrayLists
- LinkedLists (Singly, Doubly, Circular)
- Growth Rates
- Big-O Notation, How to determine theoretical running time of an algorithm

1. Consider the following Java Class

```
public class Duck {
    private String name;
    public Duck() {
        this.name = n;
    }
    a. What does the private keyword mean?
```

b. Consider the following line of code in a demo class:

```
Duck don = new Duck("Donald");
```

This line of code results in an error. Why is this error occurring?

c. Rewrite the constructor below so that the line of code from part B work correctly

2. What is an **interface** in Java?

3. What will the following code print out?

int myArray[] = {1, 2, 3, 4, 5};

```
for(int i = 0; i < myArray.length - 1; i++) {</pre>
```

System.out.println(myArray[i+1] * 2);

}

- 4. True/False. To add a node to the very end of a doubly linked list, we must traverse the entire linked list first.
- 5. The code below prints out an N x N multiplication table.

```
public void print_table(int n) {
  for (int i =1; i <= n; i++){
     for (int b=1; b <= n; b++){
        System.out.print(i*b + " ");
     }
    System.out.println();
   }
}</pre>
```

- a. For each instruction in the function, clearly mark/label the running time of that operation.
- b. What is the total running time (in Big-O) of this function?
- 6. What is the running time of printing out a Circular Linked List?
 - a. O(1)
 - b. O(N)
 - c. O(N²)
 - d. O(X^N)
- 7. What is the difference between an Array, and an ArrayList?

8. Consider this basic Node class that is used in a circular linked list.

```
public class Node {
    private String name;
    private Node next;
    private Node prev;
    public Node(String c) {
        this.name = c;
        this.next = null;
        this.prev = null;
    }
    public Node getNext() {
        return this.next;
    }
    public Node getPrev() {
        return this.prev;
    }
    public void setNext(Node newNode) {
        this.next = newNode;
    }
    public void setPrev(Node newNode) {
        this.prev = newNode;
    }
```

a. A new node needs to be inserted into the circular linked list before the head. Supply the code below so that a new node (newNode) will get added. You can assume that the circular linked list has at least 1 node already in it. The linked list class does keep track of the head node, and tail node.

public void addBeforeHead(Node newNode){

}

b. What is the running time of your algorithm from part A (You must state your answer in Big-O notation)