## Final Study Guide

## Logistics

- Wednesday, December 13<sup>th</sup> @ 2:00 PM 3:50 PM in Romney Hall 008
- Time length: 110 minutes. This exam is designed to be completed in 60-75 minutes.
- 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
  - Illustrate the steps of \_\_\_\_\_ sort
  - What does the stack/queue look like after X operations?
  - Complete the line of code so that X happens.
  - What does this (recursive) method do?

## Content

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

- Basic Java Classes, Class Structure, Methods, Operations, if statements, loops, OOP
- Basic Linked Lists
- Big-O Notation, How to determine running time of an algorithm
- Stacks
- Queues
- Bubble Sort
- Selection Sort
- Merge Sort
- Quick Sort
- Linear Search/Binary Search
- Recursion

- 1. What is the running time of adding a new element to a stack?
  - a. O(1)
  - b. O(N)
  - c. O(N<sup>2</sup>)
  - d. O(logn)

2. How does Merge Sort achieve O(nlogn) running time?

3. True/False: The Binary Search algorithm only works on a sorted dataset.

```
4. Consider the following code:
```

```
Queue<String> queue = new LinkedList<String>();
queue.add("Blue");
queue.add("Red");
queue.add("Yellow");
System.out.println(queue.remove());
queue.add("Green");
queue.add("Purple");
System.out.println(queue.peek());
queue.remove();
queue.add("Orange");
System.out.println(queue.remove());
```

- I. What is the output of the code above?
- II. What is the running time of the code above?

III. Illustrate the current contents of the Queue after the code finishes.

```
Front of queue
```

Back of Queue

5. Given the following unsorted array:

10	6	21	14	1	3	5

Suppose you are running **selection sort** to sort this array of integers. Selection sort consists of several iterations across the array. Illustrate the steps of selection sort for each iteration until the array is sorted

Iteration 1

Iteration 2

Iteration 3

Iteration 4

Iteration 5

Iteration 6

Iteration 7

6. The table below lists the big-O running times of certain operations. Fill in the missing spots of the table with the correct running time.

Linear Search	
Quick Sort	O(n <sup>2</sup> )
Binary Search	
Popping an element from the Stack	
Printing out a linked list using	O(n)
recursion	

7. Suppose you want to create your own Stack data structure class, but you need to decide if you should use an Array or a Linked List. In general, when should you use an array vs a LinkedList as an underlying data structure for a stack?

8. What is a stack overflow?

9. True/False: It doesn't matter what sorting algorithm I use; they all do the same thing in the end.