

# COMP 221 Quiz 3

Due: Monday, November 4, by 11:59 pm

## 1 Guidelines

Please either type up or write *neatly* your solutions to the questions.

**Do your own work:** Quizzes should be individual work - do not discuss with others in your class or preceptors. You may ask clarifying questions to me. You may use: the textbook, Moodle, Notion, and other resources that are shared on those sites. Please do not Google for solutions. That's just not giving yourself enough credit.

Make sure you have your name on your quiz!

- **Question 1: Sorts** Three sorts are shown below (heap, merge, quick). The first line of each sort shows the original array (they are all the same). The remaining lines show the updates to the array being sorted. Examine the arrays carefully, and write down the name of the sort that is being shown. You don't need to explain your reasoning (unless you want to!), just the name of the sort is enough.

– Sort 1

Index: 0	1	2	3	4	5	6	7
38	55	42	1	9	26	19	13
26	13	19	1	9	38	42	55
26	13	19	1	9	38	42	55
9	13	19	1	26	38	42	55
1	9	19	13	26	38	42	55
1	9	13	19	26	38	42	55
1	9	13	19	26	38	42	55

– Sort 2

Index: 1	2	3	4	5	6	7	8
38	55	42	1	9	26	19	13
55	38	42	13	9	26	19	1
42	38	26	13	9	1	19	55
38	19	26	13	9	1	42	55
26	19	1	13	9	38	42	55
19	13	1	9	26	38	42	55
13	9	1	19	26	38	42	55
9	1	13	19	26	38	42	55
1	9	13	19	26	38	42	55
1	9	13	19	26	38	42	55

– Sort 3

Index: 0	1	2	3	4	5	6	7
38	55	42	1	9	26	19	13
38	55	42	1	9	26	19	13
38	55	42	1	9	26	19	13
38	55	42	1	9	26	19	13
38	55	1	42	9	26	13	19
1	38	42	55	9	13	19	26
1	9	13	19	26	38	42	55

- **Question 2: Partitions**

When discussing Quicksort, we talked about how it is based around the idea of partitioning. In class, we used the Lomuto partition to implement Quicksort. In the homework, you got a sense of how the Hoare partition works.

Briefly describe the major differences in how the two partitioning approaches work. Although they both have the same big-O, which one is faster (or are they the same)?

- **Question 3: Divide and Conquer**

Given a **sorted** array, come up with a divide and conquer algorithm that will check if there are any elements in the array that are larger than its index. For instance,  $[-5, -3, 0, 2, 3]$  would be valid, while  $[0, 1, 2, 4, 6]$  would not be.