#### **School of Computer Sciences**



#### **CPT 212 Design & Analysis of Algorithms**

# ASSIGNMENT I : Principles of Analysis of Algorithms and Sorting Methods Semester II 2024/2025

#### **Objectives**

- Manipulate data structures or algorithms in problem solving and programming.
- Perform complexity analysis of algorithms.

#### **Specification**

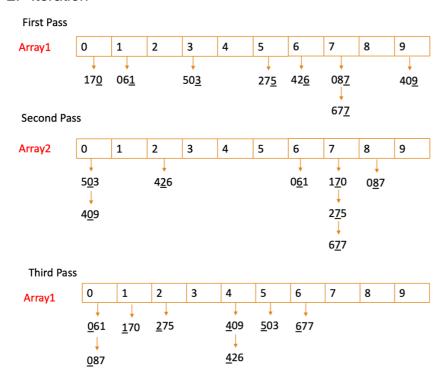
The figure below shows how a sorting algorithm sorts a list of number.

#### 1. Initialize

Example: 275, 087, 426, 061, 409, 170, 677, 503

Array1	0	1	2	3	4	5	6	7	8	9
Array2	0	1	2	3	4	5	6	7	8	9

#### 2. Iteration



#### 3. Reorder

Sorted list: 061 087 170 275 409 426 503 677

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- 1. Study and understand the algorithm in the figure, and write a Java program that sort **exactly** as the figure described. Any deviation from the step, no mark will be given. Example, the figure shows arrays in Initialization, and you are not using arrays, then no mark is given for the initialization step. Add comments in the source codes according to the explanation of the figure. Assumption: positive integer with the same length. (40%: Initialization=5%, Iteration, first pass=10%, second pass=10%, subsequent pass=10%, Reorder=5%)
- 2. Modify the sorting algorithm above to sort a list of word. A word is a string that makes up of alphabets [a-z]. A word consists of at least one character, and the length may not be the same. The Java program must be a modification of the earlier program, and not a different implementation. A different implementation will get zero mark. (30%)
- 3. Perform complexity analysis on both the algorithms by experiments. Count the number of primitive operations performed by the algorithm by adding counters to the program. Plot the graph: number of primitive operations vs n. Determine the big-O for both algorithms based on the results of the experiment. (30%)

This assignment is to be carried out in a group of 3 (maximum). References taken from any sources must be quoted and declared. No sharing of answers with other groups. Penalty for late submission, no excuse for late submission will be accepted.

- . Program and report submission deadline: Sunday, 11/5/2023 11.59 pm.
- Only one of the group leader has to submit the work.
- . Report to me if there is any group member that didn't do their work.

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### **Assignment Assessment Rubric**

	Excellent (80-100%)	Good (65-79%)	Moderate (40-64%)	Poor (0-39%)	Total
	Algorithm is	Algorithm is	•	Algorithm	
	implemented	implemented		does not	
Part 1:	according to the	according to the		implement	
Sorting	steps given. Codes	steps given. Codes		according to	
algorithms	are clearly	are not		the steps	
(40%)	commented.	commented.	-	given.	
			Algorithm can sort words in some	Algorithm is	
	Algorithm can sort	Algorithm can sort	cases and fail in	not a	
	words. It is the	words. It is the	some cases. It is the	modification	
	modification of the	modification of the	modification of the	of the earlier	
Part 2:	first algorithm.	first algorithm.	first algorithm.	algorithm or	
Modification	Algorithm is clearly	Algorithm is not	Algorithm is clearly	program	
(30%)	commented.	clearly commented.	commented.	cannot run.	
	All counters are	Some counters are incorrectly added/ not added. Graphs are plotted.	Many counters are incorrectly added/not added. Some		
	correctly added.	Correctly specify	graphs are	No counter is	
	Graphs are plotted.	the time	incorrectly plotted.	added. No	
	Correctly specify the time complexity	complexity of the algorithms, but	Correctly specify the time complexity	graphs. No time	
	of the algorithms	some of the graphs	of the algorithms	complexity	
Part 3:	and correctly justify	obtained in the	but do not analyze	given. No	
Analysis	by analyzing the	experiments are	the graphs	analysis being	
(30%)	graphs obtained.	not analyzed.	obtained.	carried out.	