CT5175 Algorithms and Logical Methods Assignment

Due Date: 24/11/2021 @ 23:59

For each of the questions below, you are required to provide:

1. A full code implementation in Java.
2. A short report in .pdf format that briefly explains how each algorithm works, and how your solutions were implemented, with reference to specific code snippets. Pseudocode is strongly encouraged for these explanations, but you may also use combinations of flowcharts, diagrams, plain text and code snippets also. This document should be no longer than 12 pages. A generic template is provided.

It is expected that additional independent research outside of the course notes will be required to complete this assignment. Take care to reference any websites/books/lecture notes that you make use of when writing your report. When you are finished, the .pdf document and your code should be uploaded in a .zipped folder to Blackboard. For question 1 the objective of this assignment is about fully understanding these sorting algorithms and how they are implemented through your own explanation. We are not examining your ability to code the sorting algorithm code which in itself is very well known.

This is an individual assignment and therefore the normal University of Galway plagiarism rules apply regarding taking material from the web or from each other. In the event that you are informed or use ideas proposed in work that is published then normal referencing is expected. Plagiarised submissions will be penalised significantly. A number of students may be randomly selected to outline more details of their work in 1 to 1 meetings with the lecturer as part of the grading process.

Question 1 (20 Marks)

With the aid of both implementations, can you demonstrate the similarities, differences and efficiency comparisons between selection sort, and quick sort. Any implementation should involve taking an inputted series of n numbers from console and then outputting the same series of numbers to screen in a fully sorted order. The focus of your submission should be on communicating your own knowledge and understanding as clearly as possible.

A. Selection Sort (8 Marks)
B. Quick Sort (8 Marks)
C. Discussion around efficiency and differences of each with reference to code segments. (4 Marks)

Question 2 (20 Marks)

Write two Java programs (or alternatively one Java programme that includes the two alternative implementations) which can calculate the solution to the following series to the value n where n is entered by the user via console.

A. Code **without using recursion OR a function** (8 Marks)
B. Code **using recursion**. (8 Marks)
C. Discuss briefly the efficiency of your algorithm. (4 Marks)

1

1 1

1 2 1

1 3 3 1

1 4 6 4 1

1 5 10 10 5 1

1 6 15 20 15 6 1

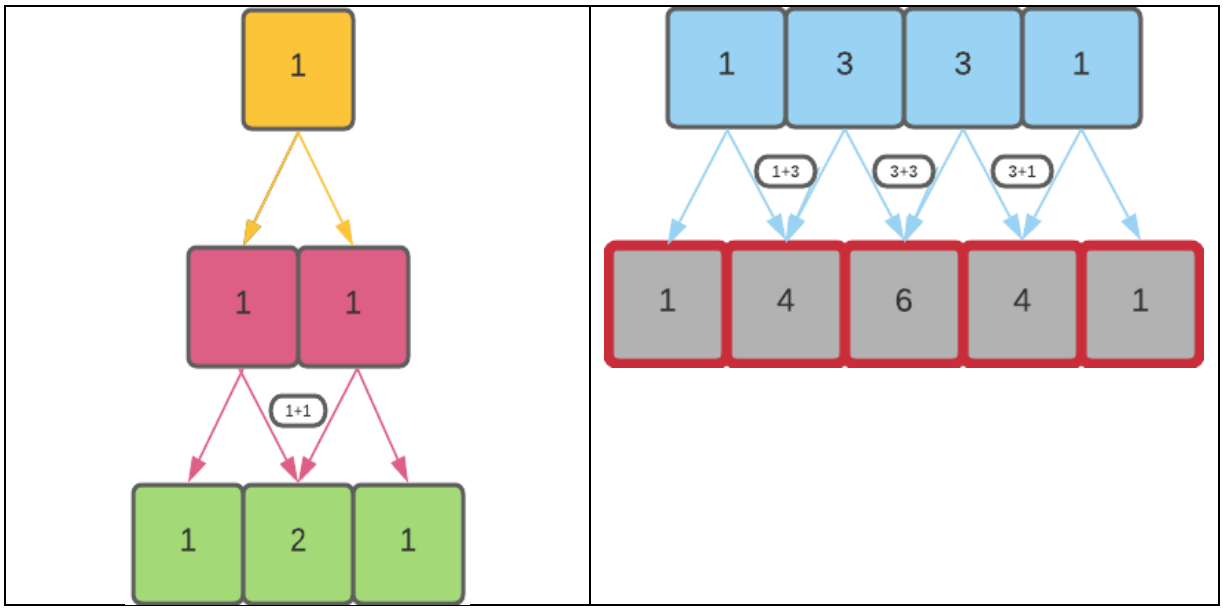
1 7 21 35 35 21 7 1

1 8 28 56 70 56 28 8 1

1 9 36 84 126 126 84 36 9 1

1 10 45 120 200 252 200 120 45 10 1

The sequence begins with a single number of the value 1, and all rows begin and end with the value 1, but all other values are calculated via the addition of the adjoint values from the previous row. See here for two examples:



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Assignment Template

Name: _____ Student Number: _____

Question 1	Marks
Question 2	Marks