

COMP3506/COMP7505—Algorithms and Data Structures

School of Information Technology and Electrical Engineering

Week 5 Tutorial

Credit: To gain tutorial credit for this week, either:

(a) Submit **PDF file** via online submission system **before midnight Sunday** prior to the week of the tutorial - attempt all questions, write your answers *in your own words** and submit them to the online submission system; or

(b) Attend and participate in the tutorial that you signed up for using SI-Net. Sign the attendance sheet as you enter the tutorial.

* Refer to the university's definition of plagiarism. If you quote someone else's words, use quote marks "... " and state the reference and page number.

Rationale: As in most courses, the best way to learn new material is to work on examples that require you to exercise your new knowledge. The tutorial exercises are essential to making progress in this course. They provide good preparation for the assignments and examinations. The questions at the end of each chapter of the text book are also useful for reinforcing the material in lectures.

Tutorial 3: This tutorial revises asymptotic analysis and also covers development of algorithms that make use of Stacks and Queues.

Question 1

Give a big-Oh characterization, in terms of n , of the running time of the following algorithm.

Algorithm SumEven

Input: An array A storing $n \geq 1$ integers.

Output: The sum of the elements at even cells in A .

$s \leftarrow A[0]$

for $i \leftarrow 2$ to $n - 1$ by increments of 2 do

$s \leftarrow s + A[i]$

return s

Question 2

Algorithm A executes an $O(\log n)$ -time computation for each entry of an n -element array. What is the worst case running time of Algorithm A?

Question 3

Given an n -element array X , Algorithm B chooses $\log n$ elements in X at random and executes an $O(n)$ -time calculation for each. What is the worst-case running time of Algorithm B?

Question 4

Suppose you have a deque D containing the numbers (1, 2, 3, 4, 5, 6, 7, 8), in this order. Suppose further that you have an initially empty queue Q . Give a pseudo-code description of a method that uses only D and Q (and no other variables or objects) and results in D storing the elements (1,2,3,5,4,6,7,8), in this order.

Question 5

Describe how to implement the stack ADT using two queues. What is the running time of the push() and pop() methods in this case?