COMP10120 Practical Set 9: Linked Lists and C++ Syntax

Please read the questions carefully. Name each program based on your student number, the practical set number and question number. For this set (set9), question 1 should be named 1234567s9q1.cpp where your student number replaces 1234567. All questions that you are submitting can be zipped into a single file called 1234567s9.zip, where 1234567 is your student number and s9 refers to set 9. Please also include a readme.txt file which says which compiler you used to test your implementation. This zipped file must be submitted via Moodle for grading.

Part 1

1. A stack is a data which can be represented as a linked list. A stack is a constrained version of a linked list because it is a last in first out (LIFO) data structure. Nodes can only be added or removed at the top of the stack. Modify the **C Program** Linked List given in the lecture and on Moodle to create **a stack.** The same functions for adding, removing, printing nodes should be present.

2. **To compile a C++ Program from the command line, the process is exactly the same as for C files. Remember to save your program with the *.cpp* extension. Instead of using gcc, use g++. For example to compile a program called prog.cpp, use the following: `g++ C:\Comp10120\Practical8\prog.cpp`.**

   Write a C++ Program that asks a user to input **six** numbers using the keyboard via the command prompt. The program should then print out the following to the console screen:
   - **i.** The sum of the six numbers
   - **ii.** The average of the six numbers
   - **iii.** The max of the six numbers

3. Write a C++ Program which prompts a user to enter 3 numbers representing the lengths of the sides of a triangle. The program should contain a function which uses these three values to calculate the area of a triangle (use Heron's formula). One caveat is that if any side is over 100 then the area function should default to calculating a triangle with the 3 sides = 100. **This program must demonstrate the use of a function with default arguments.**

Part 2 Portfolio Ideas

4. A queue is a data which can be represented as a linked list. A queue is a constrained version of a linked list because it is a first in first out (FIFO) data structure. Nodes can only be added to the end of the queue and removed from the start of the queue. Modify the **C Program** Linked List p given in the lecture notes and on Moodle to create a queue data structure. The same functions for adding, removing, printing nodes should be present.

5. If program logic and operations are identical for different data types, function templates can be efficient and convenient.
   Write a C++ Program which has a function template which takes two arguments/variables and swaps them. The template should work for integers, doubles and chars. Also demonstrate how to call the template in your program for the different argument types. (Hint: function must use pass by reference).