Information on the Exam in Programming Proficiency and CPSC 301
(Includes a sample EPP)

<u>Description of CPSC 301:</u>

This is a 2-unit credit/no credit course. It is a course taught entirely in lab, and has two required 2-hour 50-minute lab sessions per week. It will review, reinforce, and expand on programming concepts and skills taught in CPSC 120, 121, and 131. All programming assignments will be done in the closed labs, with outside work limited to reading and studying text and supplementary material, doing suggested exercises, etc. Attendance is very important; those who miss too many lab sessions will fail the course. Those who pass the course will have satisfied the requirement for the EPP.

<u>CPSC 301 Initial Exam / Exam in Programming Proficiency</u>

During the first 2 weeks of class, all students in the course will take an in-lab programming exam. This is the Exam in Programming Proficiency.

Those that pass have three options:

- Stay in the course and still attend the labs to sharpen your programming skills,
- Stay in the course, but do not attend labs and do no more work,
- Drop the course.

For the first two cases, you will get the 2 unit credit for the course, in addition to satisfying the EPP requirement. Those that drop will have satisfied the EPP requirement only. Those who pass the exam, and wish to drop should consult the instructor or the CS Department Office to make sure that you are marked as having passed the EPP.

As a rule, only those students who are enrolled by and attend the first class meeting will be allowed to take the initial exam. (See possible exceptions below.) Those adding later or those missing the first meeting should contact the instructor immediately. The default is that such students must attend the entire semester, and do all the other work in the course.

Important!!! If you wish to take the EPP, but the CPSC 301 sections are filled and closed, please attend the first meeting of one of the sections and sign up on the Supplemental Sheet. The instructor will explain how some extra students may be able to take the EPP without registering for a section. This option is available **only** if you attend the first meeting and sign up.

Examination policy: The initial programming exams will be done in a laboratory setting where students will be required to write programs and documentation on the computer. Published text will be allowed (open book policy), but no lecture notes, copies of personal program listings, or electronic media (hard drive, flash memory, CD's, Zip drives, etc.) including cell phones will be allowed except for authorized software (compiler, word processor, etc.). Furthermore, no access to the Web except to the class Titanium site will be allowed during the exams. **There should be no help given or accepted during exams. Any violation will be treated as an act of academic dishonesty.**

Exam topics: The CPSC 301 initial exams will cover the following main topics in CPSC 120, 121, and 131. Please remember that texts are allowed during the exam, but **no lecture notes or code listings.**

Program design with pseudocode using modularity and information hiding
Program documentation
Correct and appropriate use in programs of the following

- standard control structures for assignment, selection, repetition
- functions
- input and output to and from text and binary files
- arrays and strings
- pointers and dynamic variables
- recursion
- classes and objects of the classes
- templates
- operator overloading
- lists, stacks, queues, binary trees with both array and linked list implementations
- searching and sorting

The following topics will not be emphasized in the exam, but **please note that all instructors for upper division courses will expect you to know and use them**. If any student does not know and understand them, it is the **student's responsibility** to remedy the deficiency.

- hashing
- B, B+ trees
- inheritance
- polymorphism
- virtual functions

Exam format: The exam will be spread over two sessions, each 2 hours and 50 minutes in length. Part I will consist of three problems that ask for a short program or a piece of code to be added or revised. No documentation will be required. Part II will consist of designing and writing a program to meet the specifications given. Besides the actual code, a short design document will be asked for, and some minimal documentation will be required. The exact specifications including documentation will be given. Students will be asked to submit their files through the class Titanium site at the end of each session.

Sample Exam: A sample exam is attached to this document. Some of the problems indicate that some files are available. They are standard files that you can look up in your texts or create yourself. For example, IntListNode class implements a simple node for a linked list holding integers.

Sample Exam

Part I (20 points each)

1. Write a complete C++ program that takes the judges' scores for a gymnastic event and finds each contestant's score. It should satisfy **all** the following specifications: it first reads in an integer N that gives the number of judges. It then reads in a contestant number followed by N integers which are the scores given the contestant by the N judges. The scores should be read into an array, and then the program calls a function called **findAverageScore** that takes N and the array of judges' scores as arguments. The function should find and drop the highest score and the lowest score, and then find and return the average of the remaining N-2 scores. The main should then print the contestant number and the average score s/he receives for the event to the screen. It will continue to do this (read in the contestant number, then the N integers, then print the contestant number and the calculated score on a new line) until a negative value is entered for the contestant number. The program will then print the contestant number who scored the highest. (You may assume no ties will occur.) All input will be from the keyboard and you may also assume that N will never be greater than 10 and never less than 3. **You may format the output in any way as long as it is readable and correct, and you may assume all inputs are correct.** (**JUST WRITE CODE; NO DOCUMENTATION REQUIRED except for your NAME and ID at the start of the file!**)

Name your program **prob1.cpp**. Submit it to the EPP - Problem 1 section on the class Titanium site. If you wrote more than one file containing code, make sure to send and copy them as well. Remember to put in your name and ID at the start of each file.

Sample output screen for a session (**Bold** numbers are printed by the program; normal numbers are typed in by the user.)

```
Number of Judges: 5
34    7  5  3  7  6
Contestant 34  6
28    8  5  8  10  7
Contestant 28  7.666666667
3     5  5  3  4  4
Contestant 3   4.333333333
–1
Contestant 28 had the highest score.
<program ends>
```

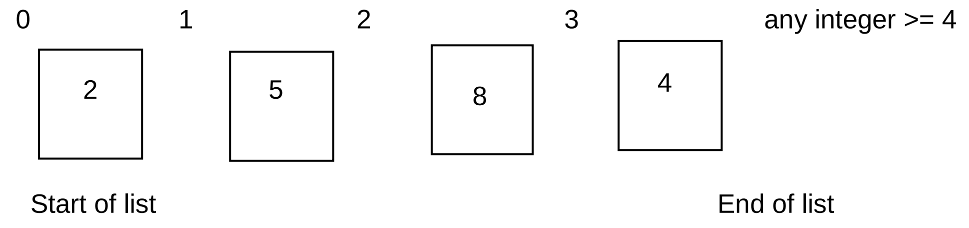
2. On the class Titanium site for Problem 2, you are given the following four files defining a simple linked list class called IntegerList: **IntegerList.h, IntegerList.cpp, IntListNode.h** and **IntListNode.cpp**. There is also a file called **test.cpp** that allows testing of this list containing integers. An **IntegerList** object contains one pointer pointing to the first or front node of the linked list. An **IntListNode** object contains an integer and a pointer to another **IntListNode** object following it. The main function in **test.cpp** allows you to insert integers at the front of the list and to print all integers in it.

   Add a member function to the class **IntegerList** called **AddAtPosition** that takes as parameters an integer to be placed in the list and a number indicating the position where the new integer should be inserted. **IntegerList.h** has the member function heading in the public part of **IntegerList**. All you need to do is to add the member function declaration (the body of the member function).

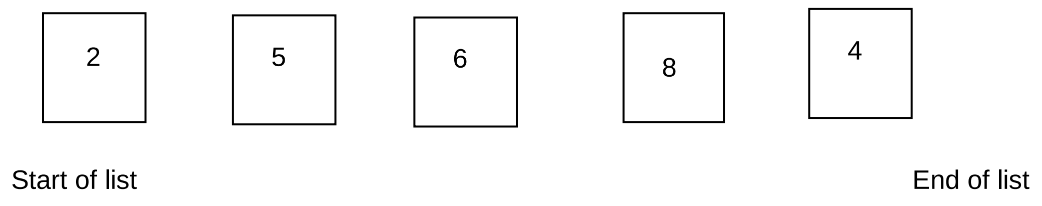
Rename the file **prob2IntegerList.cpp**. Submit it to the EPP - Problem 2 section on the class Titanium site. If you wrote more than one file containing code, make sure to send and copy them as well. Remember to put in your name and ID at the start of each file you turn in.

   See below for the how the position number corresponds to where the new node is placed in the list. If the position number is greater than the length of the list, it will just add the new node at the end.

Positions:



What above list would look like after **AddAtPosition (6, 2)** was called:



3. Take either your revised **IntegerList.cpp** or the original **IntegerList.cpp** and add a **recursive** member function **sum( )** that will return the sum of all numbers stored in the list. If it is called with the list pictured in problem 2, it should return 25 since 2 + 5 + 6 + 8 + 4 = 25.

   A non-recursive version will get no credit.

Rename the file **prob3IntegerList.cpp**. Submit it to the EPP - Problem 3 section on the class Titanium site. If you wrote more than one file, make sure to send and copy them as well. Remember to put in your name and ID at the start of each file you turn in.

Part II (40 points) (Resource files described below are available from the Titanium site under EPP-Part II.)

Write a complete C++ program called **inventory.cpp** as described below. **Documentation is required; see next page.**

Write an interactive program for processing inventory information for a parts warehouse. When started, the program should read in from a text file used for storing information between sessions. It is possible that the text file is empty. The program user is then given five choices in the main menu: enter a new part to the system, find and print data for a part when given the part ID number, find and modify data for a part when given the part ID number, copy all information to a binary archive file, and quit. These choices will be explained more fully below.

While the program is running, all parts information should be in the main memory for fast response. You may assume that there will always be enough space in memory to do this.

Specifications:

For each part, you need to store its ID (an integer), a short text description, its price, and a count of how many of that part the warehouse currently has. You are given two files **Part.h** and **Part.cpp** that hold the declarations and definitions for a simple Part class that holds just the ID, and the text description. You can revise the files as needed for this assignment.

When the program first starts, it reads in the information is stored in a text file called **textSave.txt.** You may assume that such a file always exists, but may be empty.

The program should now print a menu and ask the user to enter one of the following letters corresponding to the 4 choices below. The program will do the appropriate task, and keep repeating (get choice, do task) until the option Q is chosen,

N: this stands for a new part. The program should ask the user to enter the part ID and the rest of the part information. The program will then enter the new part information into the system.

F: this stands for finding a particular part. The program will ask for a part ID number, and search the system for a part with that ID. If it is found, the program will display the ID and all other information about the part to the screen. If it is not found, the program will print a message to the screen, telling the user that it could not be found.

A: This stands for archiving the information. Everything is output to a **binary** file called **binarySave.dat**. Any previous file of that name will be overwritten.

Q: this stands for quit. The program will write all the current parts information into the text file **textSave.txt**, overwriting any previous data before quitting.

Design considerations:

You do not need to be concerned with speed when reading from or writing to the files. However, you should try to make the other tasks run quickly. You may choose any format for the two save files, as long as they contain all the information and can be read and written by your program as text (for **textSave.txt**) and written as binary (for **binarySave.dat**).

Resources:
In addition to the two files **Part.h** and **Part.cpp**, you are given files containing templates for a Stack class, a Queue class, and a Tree class (this implements a binary search tree). For each of the three data structures, you are also provided with a test program. All function bodies are given. You may use none, any, or all of them if it will help you. You are also free to revise any of these files if you wish.

You should rename your file **inventory.cpp** and turn it in through the class Titanium site. Remember to put in your name and ID at the start of the file.

Please also turn in all additional files, old, new, or revised, that your program uses, to the file names.

Required documentation:

Your name and ID at the top for each file you write or revise.

Pseudocode for your **inventory.cpp**. This can be turned in as a separate file (Word or plain text) or as a long comment at the beginning of the C++ file.

If any variable name does not make it immediately clear what its role is, that variable must have documentation whenever it is used.

All functions, **including the main**, must have a brief documentation that states **what the function does**, and **the roles played by each of the parameters, if any**.

Other documentation is optional. Any unusual or tricky code should be documented, but please do not just repeat the code. For example, you do not need to say “for loop” because the code will say “for (...)”.