UNIVERSITY of GUELPH

CIS2520 Data Structures
Fall 2015, Assignment 4

A. Binary Heaps

There are 7 files in the folder **Heap**; do not modify them. You are asked to add two files: **HeapImplementation.c** and **myProgram.c**. The test program relies on the *Student* and *Heap* libraries. It creates a binary heap from the student data stored in **test.txt** and outputs (in any order) the top **n** students according to their grades, where **n** is a positive integer passed to the program. For example, with **test.txt** as provided, you may get:

```
$ ./a.out 1
Paula 92
$ ./a.out 3
Mary 85
Dave 90
Paula 92
```

B. Binary Search Trees

There are 7 files in the folder **BSTree**; do not modify them. You are asked to add two files: **TreeImplementation.c** and **myProgram.c**. The test program relies on the *Student* and *Tree* libraries. It creates a binary search tree from the student data stored in **test.txt** and sorts these data according to the students' grades. For example, with **test.txt** as provided:

```
$ ./a.out

Initialize()
Size=0, Height=-1, Balanced=YES

Insert(John,75)
Size=1, Height=0, Balanced=YES
```

```
Insert(Mary,85)
Size=2, Height=1, Balanced=YES

Insert(Pete,80)
Size=3, Height=2, Balanced=NO

Insert(Liz,55)
Size=4, Height=2, Balanced=YES

Insert(Tom,45)
Size=5, Height=2, Balanced=YES

Insert(Bob,60)
Size=6, Height=2, Balanced=YES

Insert(Ann,70)
Size=7, Height=3, Balanced=YES

Insert(Ashley,35)
Size=8, Height=3, Balanced=YES

Insert(Karen,65)
Size=9, Height=4, Balanced=NO

Insert(Dave,90)
Size=10, Height=4, Balanced=NO

Insert(Adam,45)
Size=11, Height=4, Balanced=NO

Ashley     35%
Tom        45%
Adam       45%
Liz        55%
Bob        60%
Karen      65%
Ann        70%
John       75%
Pete       80%
Mary       85%
Dave       90%
```

C. AVL Trees

Create a copy **AVLtree** of the completed folder **BSTree**. In **TreeImplementation.c** of this new folder **AVLtree**, modify `Insert()` so that the tree is always balanced.

SUBMISSION

Create a root folder **A4_LastName_FirstName_StudentID** with the completed **Academic Integrity file**, a **README.txt** file (optional), and the subfolders **Heap**, **BSTree** and **AVLtree**. The three sets of source files must be compilable independently using the provided **makefile**s. Zip the root folder and upload it to *Moodle*. Remember that all the files in your archive must be text files.

MARKING SCHEME

A = 30% B = 50% C = 20%