

# SCSSE, University of Wollongong

## CSCI204/MCS9204 Object and Generic Programming in C++

### Laboratory Exercise Week 9

#### Task One: A singleton

Implement a singleton class in **Single.cpp**. In a singleton we are only allowed one instance of the class to exist at a time. Your class should record how many attempts to create instances have occurred. Your class should request from the user whether to create an instance (2), destroy an instance (1) or exit (0).

Sample input and output are provided in **Input\_Single.txt** and **Single.txt**, respectively.

#### Task Two: Namespace and a template class - Bag

Define a template class **Bag** in a file **Bag.h** that belongs to a namespace **MYLIB**. A **Bag** is a collection of zero or more elements, in no particular order that may have duplicates. The public interface consists of methods to:

- Create a template class **Bag**.
- A function **add()** which can add an element to a **Bag**.
- A function **remove()** which can remove a given element from a **Bag**. If the element is duplicated, only remove the first one.
- Implement the union of two **Bag** objects in an overloaded **+** operator. The union of two **Bag** objects, b1 and b2, should be a **Bag** object containing elements that belong to b1 or b2. Remember that duplication is fine.
- An insertion operator (<<) that print all the elements in the **Bag**.

Implement member functions and insertion operator for the **Bag** in a file **Bag.cpp**.

Download the file **testBag.cpp** in which instantiates and initialize two **integer Bag** objects and two **double Bag** objects to test your **Bag** class.

Compile the program as

**CC testBag.cpp Bag.cpp**

and run the program.

Number of integers for an integer bag 1: 5

Input an integer: 1

Input an integer: 3

Input an integer: 4

Input an integer: 6

Input an integer: 9

The first integer bag contains: 1 3 4 6 9

Number of integers for an integer bag 2: 3

Input an integer: 1

Input an integer: 6

Input an integer: 8

The second integer bag contains: 1 6 8

Combine two integer bags: 1 3 4 6 9 1 6 8

Input the element that needs to be removed: 1

After the element 1 has been removed, the bag contains 3 4 6 9 1 6 8

Input the element that needs to be removed: 6

After the element 6 has been removed, the bag contains 3 4 9 1 6 8

Number of doubles for a double bag 1: 6

Input a double: 1.5

Input a double: 2.2

Input a double: 3.2

Input a double: 1.5

Input a double: 2.4

Input a double: 2.2

The first double bag contains: 1.5 2.2 3.2 1.5 2.4 2.2

Number of doubles for a double bag 2: 4

Input a double: 2.2

Input a double: 3.3

Input a double: 4.1

Input a double: 3.2

The second double bag contains: 2.2 3.3 4.1 3.2

Combine two double bags: 1.5 2.2 3.2 1.5 2.4 2.2 2.2 3.3 4.1 3.2

Input the element that needs to be removed: 1.5

After the element 1.5 has been removed, the bag contains 2.2 3.2 1.5 2.4 2.2 2.2 3.3 4.1 3.2

Input the element that needs to be removed: 4.1

After the element 4.1 has been removed, the bag contains 2.2 3.2 1.5 2.4 2.2 2.2 3.3 3.2

You can download **input\_bag.txt** to test your program by

`./a.out < input_bag.txt`