CS205 C/ C++ Programming - Lab Assignment 6

Name: 邱煜（Qiu Yu）

SID: 11611127

Part1 - Analysis

This assignment is to design a class called `Box` whose dimensions are integers and private to the class. The dimensions are labelled: length, breadth, height.

And this class should has 3 constructors: default constructor `Box()`, parameterized constructor `Box(int, int, int)`, parameterized constructor, and copy constructor `Box(const Box &)`.

And this class should has 4 member functions - `int getLength()`, `int getBreadth()`, `int getHeight()`, `long long CalculateVolume()`.

Besides, I need to overload 2 operators. `bool operator<(Box &, Box &)` and `std::ostream &operator<<(std::ostream &, Box &)`.

Finally, I need to write some test cases to check if my codes are right.

Part2 - Code

box.cpp

```cpp
#include "box.hpp"
#include <cstdlib>
#include <iosfwd>
#include <iostream>

using namespace std;

Box::Box() : length(0), breadth(0), height(0) {}
Box::Box(int l, int b, int h) : length(l), breadth(b), height(h) {}
Box::Box(const Box &box)
    : length(box.length), breadth(box.breadth), height(box.height) {}

int Box::getLength() { return length; }
int Box::getBreadth() { return breadth; }
int Box::getHeight() { return height; }
long long Box::CalculateVolume() { return length * breadth * height; }
```

```
17
18  ostream &operator<<(ostream &os, Box &box) {
19      os << box.getLength() << " " << box.getBreadth() << " "
    << box.getHeight();
20      return os;
21  }
22  bool operator<(Box &b1, Box &b2) {
23      return (b1.getLength() < b2.getLength()) ||
24             (b1.getBreadth() < b2.getBreadth() &&
25              b1.getLength() == b2.getLength()) ||
26             (b1.getHeight() < b2.getHeight() &&
27              b1.getBreadth() == b2.getBreadth() &&
28              b1.getLength() == b2.getLength());
29  }
30  bool operator>(Box &b1, Box &b2) {
31      return !(b1 < b2);
32  }
```

H3 box.hpp

```
1   #ifndef box_hpp
2   #define box_hpp
3
4   #include <iosfwd>
5
6   class Box {
7      private:
8       // members - in range [0, 100000]
9       int length;
10      int breadth;
11      int height;
12
13     public:
14      // constructor and destructor
15      Box();
16      Box(int, int, int);
17      Box(const Box &);
18      ~Box(){};
19
20      // member functions
21      int getLength();
22      int getBreadth();
23      int getHeight();
24      long long CalculateVolume();
25
```

```
};

// overload operator
std::ostream &operator<<(std::ostream &, Box &);
bool operator<(Box &, Box &);
bool operator>(Box &, Box &);

#endif
```

H2 Part 3 - Result & Verification

H3 Test.cpp

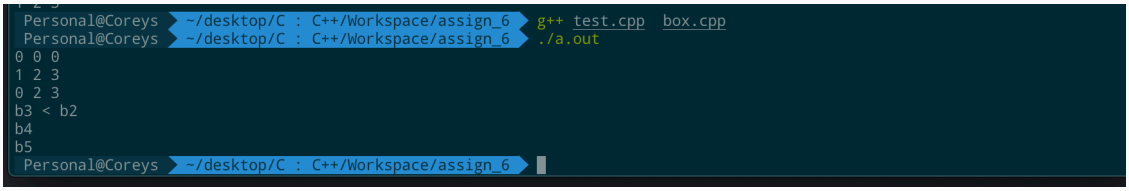
```
#include <iostream>
#include "box.hpp"

using namespace std;

int main(){
    Box b1;
    Box b2(1,2,3);
    Box b3 = Box(0,2,3);
    Box b4(1,1,3);
    Box b5(1,2,2);

    cout << b1 << endl;
    cout << b2 << endl;
    cout << b3 << endl;

    if(b3 < b2){
        cout << "b3 < b2" << endl;
    }
    if(b4 < b2){
        cout << "b4" << endl;
    }
    if(b5 < b2){
        cout << "b5" << endl;
    }
    return 0;
}
```

H4 Expected Output

```
0 0 0
1 2 3
0 2 3
b3 < b2
b4
b5
```

Real Output

```
0 0 0
1 2 3
0 2 3
b3 < b2
b4
b5
```



Part 4 - Difficulties & Solutions

1. I met difficulties when implementing copy constructor. We need to use `const` variable as the parameter.