Object Oriented Programming (IGS2130)

Lab 9

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Exercise #1

Hint
05. p14

- Create a friend class of IntArray class, named IntArrayHandler. The main() function below should run as like the execution example.

```
#include<iostream>
#include<iomanip>
#include<ctime>
#include<cstdlib>
using namespace std;

class IntArray
{
private:
    int m_len{ 0 };
    int* m_data{ nullptr };

public:
    IntArray(int len)
        : m_len{ len }
    {
        m_data = new int[m_len];
    }
    ~IntArray() {
        if (m_data) delete[] m_data;
    }
};

const int arSize = 20;
```

```
int main() {
    int i;
    int data1[arSize], data2[arSize];
    IntArray ar1{ arSize }, ar2{ arSize };
    srand((unsigned int)time(NULL));
    for (i = 0; i < arSize; ++i) {
        data1[i] = rand() % 100;
        data2[i] = rand() % 100;
    }
    IntArrayHandler handler{ &ar1 };
    handler.setArray(data1, arSize);
    cout << "== ar1: displayArray() ===" << endl;
    handler.displayArray();
    cout << "====== ar1: stat() =======" << endl;
    handler.stat();
    cout << "==========================" << endl;
    handler.setIntArray(&ar2);
    handler.setArray(data2, arSize);
    cout << endl << "== ar2: displayArray() ===" << endl;
    handler.displayArray();
    cout << "====== ar2: stat() =======" << endl;
    handler.stat();
    cout << "==========================" << endl;
    return 0;
}
```

Exercise #1

```
== ar1: displayArray() ===
[ 0] 27
[ 1] 30
[ 2] 55
[ 3] 44
[ 4] 35
[ 5] 67
[ 6] 79
[ 7] 44
[ 8] 25
[ 9] 27
[10] 71
[11] 5
[12] 95
[13] 88
[14] 84
[15] 20
[16] 51
[17] 49
[18] 37
[19] 10
====== ar1: stat() =======
# of elements: 20
        Sum: 943
    Average: 47.15
==========================
```

```
== ar2: displayArray() ===
[ 0] 13
[ 1] 9
[ 2] 50
[ 3] 50
[ 4] 11
[ 5] 97
[ 6] 62
[ 7] 94
[ 8] 68
[ 9] 74
[10] 18
[11] 82
[12] 14
[13] 87
[14] 1
[15] 30
[16] 66
[17] 2
[18] 83
[19] 29
====== ar2: stat() =======
# of elements: 20
        Sum: 940
    Average: 47
==========================
```

Exercise #2

Hint
05. p19-21, p23-24

- Create a Test class so that the main() function below is executed as an execution result. The Test class has an id and an integer as member variables. The id is automatically generated when the object is instantiated. The integer value is supplied as an argument to the constructor. For unique ID generation and information about the number of objects, the class contains static member variable(s) and static member function.

```
# of objects: 0
[t1] data: 10, id: 0
[t2] data: 20, id: 1
[t3] data: 30, id: 2
[t4] data: 40, id: 3
# of objects: 4
```

```
int main() {
    cout << "# of objects: ";
    cout << Test::NumOfObjects() << endl;

    Test t1{ 10 }, t2{ 20 }, t3{ 30 }, t4{ 40 };
    cout << "[t1] data: " << t1.getData() << ", id: " << t1.getID() << endl;
    cout << "[t2] data: " << t2.getData() << ", id: " << t2.getID() << endl;
    cout << "[t3] data: " << t3.getData() << ", id: " << t3.getID() << endl;
    cout << "[t4] data: " << t4.getData() << ", id: " << t4.getID() << endl;

    cout << "# of objects: ";
    cout << Test::NumOfObjects() << endl;
    return 0;
}
```

Exercise #3

Hint
06. p13

- Write an Apple class and a Banana class that are derived from a common Fruit class. Fruit should have two members: name and color
  - The following program should run:

```
int main() {
    Apple a{ "red" };
    Banana b;

    cout << "My " << a.getName() << " is " << a.getColor() << ".\n";
    cout << "My " << b.getName() << " is " << b.getColor() << ".\n";

    return 0;    return 0;
}
```

  - The program produces the result:

```
My apple is red.
My banana is yellow.
```

Exercise #4

Hint
06. p13

- Add a new class to the previous program called RedBanana that inherits from Banana.
  - The following program should run:

```
int main() {
    Apple a{ "red" };
    Banana b;
    RedBanana c;

    cout << "My " << a.getName() << " is " << a.getColor() << ".\n";
    cout << "My " << b.getName() << " is " << b.getColor() << ".\n";
    cout << "My " << c.getName() << " is " << c.getColor() << ".\n";

    return 0;
}
```

  - The program produces the result:

```
My apple is red.
My banana is yellow.
My red banana is red.
```

Exercise #5

Hint
06. p26

- Write an EBook class that is derived from Book class. The Book should have three members: title, ISBN, and price. The Ebook has two additional members, DRMKey and format.
  - The following program should run:

```
int main() {
    Book book("Modern C++ Programming Cookbook", "1800208987", 49.99);
    book.ShowBookInfo();
    cout << endl;

    EBook ebook("Modern C++ Programming Cookbook(ebook)", "1800208987", 34.99, "dkb34x!@*~");
    ebook.ShowEBookInfo();

    return 0;
}
```

  - The program produces the result:

```
Title: Modern C++ Programming Cookbook
ISBN: 1800208987
Price(USD): 49.99

Title: Modern C++ Programming Cookbook(ebook)
ISBN: 1800208987
Price(USD): 34.99
DRMKey: dkb34x!@*~
Format: Kindle
```

Exercise #6

- Add a new class to the previous program called EBookLibrary. The new class should contain multiple eBooks and show all information of the stored eBooks.
  - The following program should run:

```
int main() {
    EBookLibrary elib;
    elib.AddBook(new EBook{ "Book1", "1234567890", 10.99, "AAAAAA", "ePub" });
    elib.AddBook(new EBook{ "Book2", "2345678901", 20.99, "BBBBBB" });
    elib.AddBook(new EBook{ "Book3", "3456789012", 30.99, "CCCCCC", "ePub"});
    elib.AddBook(new EBook{ "Book4", "4567890123", 40.99, "DDDDDD" });
    elib.ShowAllBooks();

    return 0;
}
```

```
class EBook;

const int MAX_BOOK = 100;
class EBookLibrary {
private:
    EBook* m_books[100];
    int m_cnt;
public:
    EBookLibrary();
    ~EBookLibrary();
    void AddBook(EBook* book);
    void ShowAllBooks(void);
};
```

  - The program produces the result:

```
Title: Book1
ISBN: 1234567890
Price(USD): 10.99
DRMKey: AAAAAA
Format: ePub

Title: Book2
ISBN: 2345678901
Price(USD): 20.99
DRMKey: BBBBBB
Format: Kindle

Title: Book3
ISBN: 3456789012
Price(USD): 30.99
DRMKey: CCCCCC
Format: ePub

Title: Book4
ISBN: 4567890123
Price(USD): 40.99
DRMKey: DDDDDD
Format: Kindle
```