## Exercise 3: The technicalities：functions and classes

**1. Purpose and requirements**

**Purpose:** Familiar with functions and classes, including: (1) declarations and definitions; (2) scope; (3) namespace; (4) static; (5) friend;

**Requirements:** all the classes (declaration and definition) and the main are required in separated files, that is your program should have class.h, class.cpp, main.cpp, and so on.

**2. Experiment contents：**

(1) Create three files: my.h, my.cpp, and use.cpp.

Analyze the following code, write the statement in the Dashes, assign the code into the given three files, then output the result.

#include <iostream>

using namespace std;

class A {

static int m\_counter;

public:

A();

~A();

static void display();

}

—————————— //initialize m\_counter to 0；

A：：A()

{

m\_counter++;

}

A::~A()

{

m\_counter--;

}

void A::display()

{

cout<<”There are:”<<A::m\_counter<<”objects of class A.\n”;

}

int main()

{

A a1;

A a2;

A a3;

A::display();

a1.display();

}

(2) Define a **Point** class, which allows the following statement：

Point p1(1,2),p2(p1);

Please correct the following program to make it run! Separate these code into three files: point.h, point.cpp, main.cpp, Give out the result.

#include <iostream.h>

class Point

{

public:

Point (int a, int b)

{

x=a;y=b;

}

void fun (Point &p);

void fun (Point \* p);

private:

int x,y;

}；

void fun (Point &p)

{

x=p.x ;

y=p.y ;

cout<< "The fun(Point &p) "<<endl ;

}

void fun (Point \*p)

{

x=p->x ;

y=p->y ;

cout<< "Fun (Point \*p) "<<endl ;

}

Void main()

{

Point p(1,2),q(3,4) ;

p.fun(q) ;

q.fun(&q) ;

}

(3) Write a program using a single file containing three namespaces X, Y, and Z, so that the following main() works correctly:

int main

{

X::var = 7;

X::print(); //print X’s var

Using namespace Y ;

var = 9;

print(); //print Y’s var

{

Using Z::var;

Using Z::print;

var = 11;

print(): //print Z’s var

}

print(); //print Y’s var

X::print(); //print X’s var

}

Each namespace needs to define a variable called var and a function called print() that outputs the appropriate var using cout.

(4) step 1: Design a class Node, declear a data member M and a static member C, use the constructor function to initialize M, and add 1 to the static C. Then use the destructor function to subtract 1 from the static C.

Step 2: write a program that creates 3 objects, output their data members. Destruct these objects, then analys the change of static members.

Step 3: modify step 2. Write a static function to call the static member, which is a private member now.

(5) Design a class to compute the operations of complex numbers: including addition, subtraction, division, and multiplication. These functions are required to implemented using friend functions..

**3. Questions：**

Think through the experiments, and answer the following questions.

(1) About the static member, what is the different between private and public?

(2) Where else can you write the friend function?

(3) How to simplify your program? How to make your program more clear?