

# Task 4 Class

## Basic concepts

- What is `class`? What are the "data member" and "function member"? Simply describe differences between `class` and `struct`. Show the result of following program.

```
#include <iostream>
struct A { int a, b; } x;
class B { int a, b; } y;
int main() {
    x.a = 10; y.b = 5;
    std::cout << x.a << " " << y.b << std::endl;
    return 0;
}
```

- What are the meanings of keywords `public` and `private` in class? Show your understanding of them.
- What are the constructor and destructor? Read the ppt and show the type of constructor. Give an example of constructor and destructor.
- What it will be with following program? Why?

```
struct A {
    A(int) {}
    A() = default;
};
struct B1 {
    A a1{1};
    A a2(1);
};
struct B2 {
    B2(A a) {}
    void f() {}
};
B2 b1(A());
B2 b2{A()};
B2 b3(A{});
B2 b4(A{});
int main() {
    b1.f(); b2.f(); b3.f(); b4.f();
    return 0;
}
```

- Show the result of following program of each sentence in `main` function, and explain the keyword `explicit` and what the equal sign do when we create a class variable.

```
#include <iostream>
struct A {
    A(int) { std::cout << "A int Constructor!\n"; }
    A() { std::cout << "A Default Constructor!\n"; }
};
struct B {
    explicit B() { std::cout << "B Default Constructor!\n"; }
    explicit B(int) { std::cout << "B int Constructor!\n"; }
};
int main() {
    A a1 = {};
    A a2 = 1;
    A a3(1);
    B b1 = {};
    B b2 = 1;
    B b3(1);
    return 0;
}
```

- Create a `class` named `Student`, it has some data members: age, name, gender, height and weight, and some function members: constructor, destructor, `setname`, `setage`, `setheight`, `setweight`, ... . Here is an usage of `Student`.

```
#include <iostream>
class Student;
int main() {
    Student stu(17, "Alice", 'M', 1.65, 45);
    std::cout << stu.getName() << " " << stu.getHeight() << " " << stu.getAge() <<
std::endl;
    stu.setWeight(47); stu.setAge(18);
    stu.setName("Alicia"); stu.setHeight(1.67);
    std::cout << stu.getName() << " " << stu.getWeight() << " " << stu.getGender() <<
std::endl;
    return 0;
}
```

Directly put your code in the document you submitted.

## Class Hierarchy

- Explain the concept of class hierarchy, derived class and base class. What is the meaning of keyword `protected` in class? Give an example of class hierarchy and `protected`.
- What is inheritance access specifiers? How to use it? Give an example of it.
- What is the output of the following program?

```

#include <iostream>
struct A {
    A() { std::cout << "A default constructor!\n"; }
    ~A() { std::cout << "A destructor!\n"; }
};
struct B1 : A { };
struct B2 : A {
    B2() { std::cout << "B2 default constructor!\n"; }
    ~B2() { std::cout << "B2 destructor!\n"; }
};
B1 b1;
B2 b2;
int main() { return 0; }

```

- What is the output of the following program? How about the another?

```

#include <iostream>
class A {
public:
    void f() { std::cout << "A"; }
};
class B : public A {
public:
    void f() { std::cout << "B"; }
};
void g(A &a) { a.f(); }
int main() {
    B b; g(b);
    return 0;
}

```

```

#include <iostream>
class A {
public:
    void f() { std::cout << "A"; }
};
class B : public A {
public:
    void f() { std::cout << "B"; }
};
void g(B &b) { b.f(); }
int main() {
    A a; g(a);
    return 0;
}

```