Assignment 9 for Week 13

✧ Note: Write the answer and submit with the name of "***StudentID_Name_9.pdf***".

1. Describe the output after the program run.

1)

```
#include <iostream>
using namespace std;
class Base{
protected:
    int n;
public:
    Base (int m){n=m++;}
    virtual  void g1(){cout<<"Base::g1()..."<<n<<endl; g4();}
    virtual  void g2(){cout<<"Base::g2()..."<<++n<<endl;g3();}
    virtual  void g3(){cout<<"Base::g3()..."<<++n<<endl; g4();}
    virtual  void g4(){cout<<"Base::g4()..."<<++n<<endl;}
};
class Derive:public Base{
    int j;
public:
    Derive(int n1,int n2):Base(n1){j=n2;}
    void g1(){cout<<"Deri::g1()..."<<++n<<endl;g2();}
    void g3(){cout<<"Deri::g2()..."<<++n<<endl;g4();}
};
int main( ){
    Derive Dobj(1,0);
    Base Bobj=Dobj;
    Bobj.g1();
    cout<<"------------------"<<endl;
    Base *bp=&Dobj;
    bp->g1();
    cout<<"------------------"<<endl;
    Base &bobj2=Dobj;
    bobj2.g1();
    cout<<"------------------"<<endl;
    Dobj.g1();
    return 0;
}
```

2)

```
#include<iostream.h>
class Shape{
public:
```

```
    virtual double area(){return 0;}
    virtual void print()=0;
};
class Circle:public Shape{
protected:
    double r;
public:
    Circle(double x):r(x){}
    double area(){return 3.14*r*r;}
     void print(){cout<<"Circle : r="<<r<<"\t area="<<area()<<endl;}
};
class Cylinder:public Circle{
    double h;
public:
    Cylinder(double r,double x):Circle(r),h(x){}
    double area(){return 2*3.14*r*r+2*3.14*h;}
};
void shapeArea(Shape &s){cout<<s.area()<<endl;}
void shapePrint(Shape *p){p->print();}
int main(){
    Shape *s[3];
    s[0]=&Circle(10);
    s[1]=&Cylinder(20,100);
    for(int i=0;i<2;i++)
    {
        shapeArea(*s[i]);
        shapePrint(s[i]);
    }
    return 0;
}
```

3)

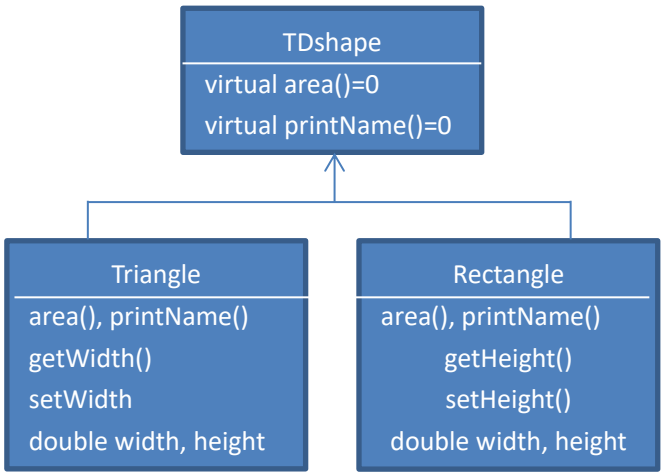
```
#include<iostream>
using namespace std;
class A{
public:
    void virtual f(){cout<<"f() in class A"<<endl;}
};
class B:public A{
public:
    void f(){cout<<"f() in class B"<<endl;}
    void fb(){cout<<"normal function fb \n";}
};
class C:public A{
```

```
public:
    void f(){cout<<"f() in class C"<<endl;}
    void fc(){cout<<"normal function fc"<<endl;}
};
void f(A *p){
    p->f();
    if (typeid(*p)==typeid(B)){
        B *bp=dynamic_cast<B*>(p);
        bp->fb();
    }
    if (typeid(*p)==typeid(C)){
        C *bc=dynamic_cast<C*>(p);
        bc->fc();
    }
}
int main(){
    A *pa;   B b;      C c;
    pa=&b;  f(pa);
    pa=&c;  f(pa);
    return 0;
}
```

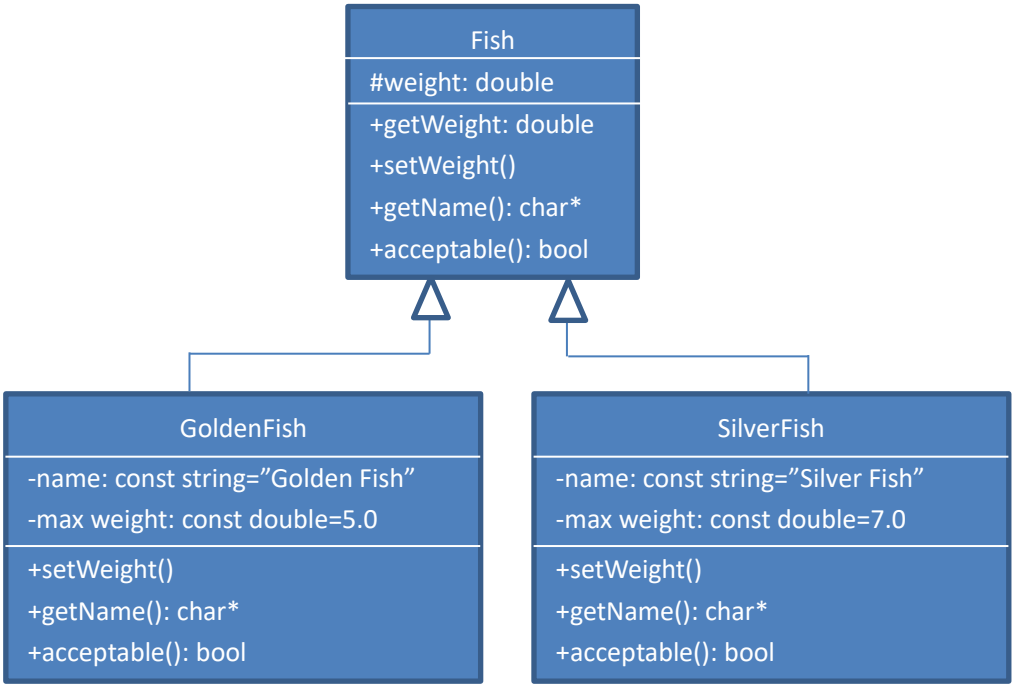
2. Thought question.
   For C++ object-oriented programming, sometimes we cannot use **objects** to program and instead we must use **pointer** and **reference**.
   What do you think about it?

3. Program Design

1) Design a program to calculate the two-dimensional shape' area by using the abstract class.
   - The pure virtual function **area()** and **printName()** are designed in the base class TDshape which area() is used to calculate the area of the geometric figure and printName() is used to print the name of the geometric figure. For example, it print "Triangle" when print the objects of Triangle class.
   - Design the main function to testify the class definition which can access the member function area() of the class Triangle and Rectangle by using the TDshape class as the interface.



2) Design a program to simulate fishing by using the mechanism of polymorphism.



✧ Note: Submit the above two Program Design source code with the file name of "***StudentId_Name_9_1 Shape.rar***" and "***StudentId_ Name_9_2 Fish.rar***".

✧ Note:
Submit your assignments as three attachments before the end of next Monday(May 27) to the Superstar platform!