

Section 2: Lecture 7

Introduction

- Constant Member function
- Abstract method
- Abstract Class

Const member function

If a member function does not alter any data in the class

```
void mul(int,int) const;
```

Abstract methods

- ▶ You can *declare* an object without *defining* it:
Person p;
- ▶ Similarly, you can declare a *method* without defining it:
public abstract void draw (int size);
- ▶ Notice that the body of the method is missing
- ▶ A method that has been declared but not defined is an abstract method

Abstract classes

- Any class containing an abstract method is an abstract class
 - You must declare the class with the keyword `abstract`:
`abstract class MyClass {...}`
 - An abstract class is *incomplete*
 - It has “missing” method bodies
-
- You cannot instantiate (create a new instance of) an abstract class

- You can declare a class to be abstract even if it does not contain any abstract methods.

// This prevents the class from being instantiated.

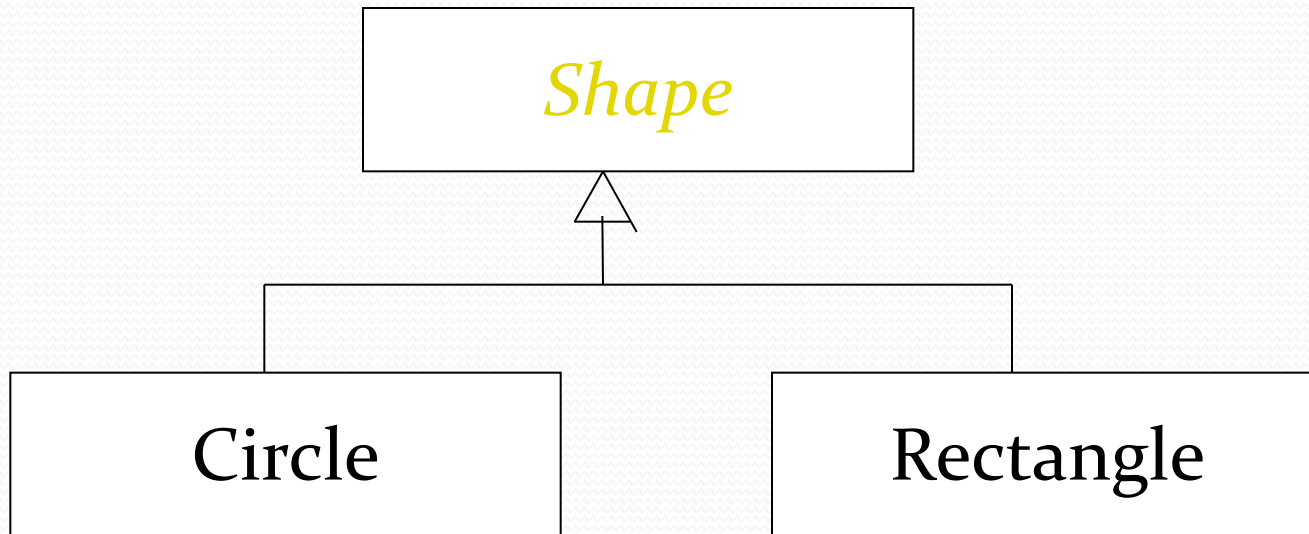
Abstract Class Syntax

```
abstract class ClassName
{
    ...
    ...
    abstract Type MethodName1();
    ...
    ...
    Type Method2()
    {
        // method body
    }
}
```

- ▶ When a class contains one or more abstract methods, it should be declared as abstract class.
- ▶ The abstract methods of an abstract class must be defined in its subclass.
- ▶ We cannot declare abstract constructors or abstract static methods.

Abstract Class -Example

- Shape is a abstract class.



The Shape Abstract Class

```
public abstract class Shape {  
    public :  
    abstract double area();  
    void move() { // non-abstract method  
        // implementation  
    }  
}
```

- Is the following statement valid?
 - Shape s = new Shape();
- No. It is **illegal** because the Shape class is an abstract class, which cannot be instantiated to create its objects.

Summary:

Abstract Classes Properties

- A class with one or more abstract methods is automatically abstract and it cannot be instantiated.
- A class declared abstract, even with no abstract methods can not be instantiated.
- A subclass of an abstract class can be instantiated if it overrides all abstract methods by implementation them.
- A subclass that does not implement all of the superclass abstract methods is itself abstract; and it cannot be instantiated.