



Abstract classes

Agenda

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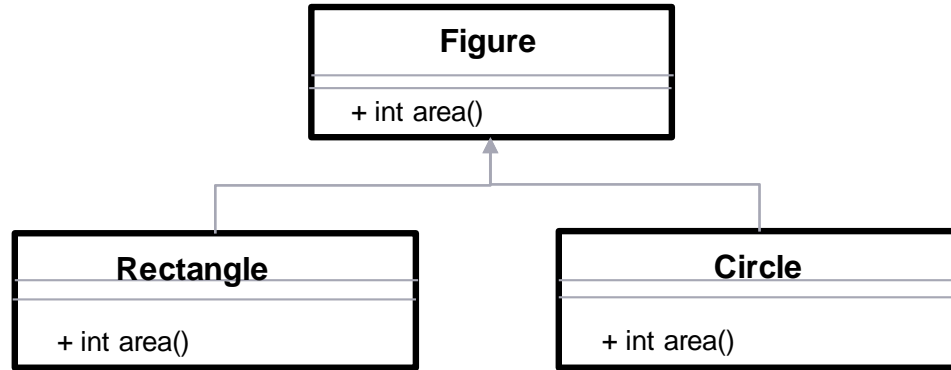
Abstract Classes

Abstract classes



Abstract Classes

- Let us see the below example of Figure class extended by Rectangle and Circle.



- In the above example `area()` for **Figure** being more generic we cannot define it. At the level of **rectangle** or **Circle** we can give the formula for area.

Abstract Classes (Contd.).

- Often, you would want to define a superclass that declares the structure of a given abstraction without providing the implementation of every method
- The objective is to:
 - Create a superclass that only defines a generalized form that will be shared by all of its subclasses
 - leaving it to each subclass to provide for its own specific implementations
 - Such a class determines the nature of the methods that the subclasses ***must implement***
 - Such a superclass is unable to create a meaningful implementation for a method or methods

Abstract Classes (Contd.).

- The class **Figure** in the previous example is such a superclass.
 - Figure is a pure geometrical abstraction
 - You have only kinds of figures like **Rectangle**, **Triangle** etc. which actually are subclasses of class **Figure**
 - The class **Figure** has no implementation for the **area()** method, as there is no way to determine the area of a **Figure**
 - The **Figure** class is therefore a partially defined class with no implementation for the **area()** method
 - The definition of **area()** is simply a placeholder
- **The importance of abstract classes:**
they define a generalized form (possibly some generalized methods with no implementations) *that will be shared by all of its subclasses*, so that *each subclass can provide specific implementations* of such methods.

Abstract Classes (Contd.).

- **abstract method** – It's a method declaration with no definition
- a mechanism which shall ensure that a subclass must compulsorily override such methods.
- Abstract method in a superclass has to be overridden by all its subclasses.
- The subclasses cannot make use of the abstract method that they inherit directly(without overriding these methods).
- These methods are sometimes referred to as subclasses' responsibility as they have no implementation specified in the superclass

Abstract Classes (Contd.).

- To use an abstract method, use this general form: **abstract type name(parameter-list);**
- Abstract methods do not have a body
- Abstract methods are therefore characterized by the lack of the opening and closing braces that is customary for any other normal method
- This is a crucial benchmark for identifying an abstract class
- area method of Figure class made Abstract.

```
public abstract int area();
```


Abstract Classes (Contd.).

Any class that contains one or more abstract methods **must** also be declared abstract

- It is perfectly acceptable for an abstract class to implement a concrete method
- You cannot create objects of an abstract class
- That is, an abstract class cannot be instantiated with the new keyword
- Any subclass of an abstract class must *either implement all of the abstract methods in the superclass, or be itself declared abstract.*

Revised Figure Class – using abstract

- There is no meaningful concept of area() for an undefined two-dimensional geometrical abstraction such as a Figure
- The following version of the program declares area() as abstract inside class Figure.
- This implies that class Figure be declared abstract, and all subclasses derived from class Figure must override area().

Improved Version of the Figure Class Hierarchy

```
abstract class Figure{  
    double dimension1;  
    double dimension2;  
    Figure(double x, double y) {  
        dimension1 = x;  
        dimension2 = y;  
    }  
    abstract double area();  
}
```

Improved Version of the Figure Class Hierarchy (Contd.).

```
class Rectangle extends Figure{
    Rectangle(double x, double y){
        super(x,y);
    }

    double area(){
        System.out.print("Area of rectangle is :");
        return dimension1 * dimension2;
    }
}

class Triangle extends Figure{
    Triangle(double x, double y){    super(x,y);    }
    double area(){
        System.out.print("Area for triangle is :");
        return dimension1 * dimension2 / 2;
    }
}
```

Improved Version of the Figure Class Hierarchy (Contd.).

```
class FindArea{
    public static void main(String args[]){
        Figure fig;
        Rectangle r = new Rectangle(9,5);
        Triangle t  = new Triangle(10,8);
        fig = r;
        System.out.println("Area of rectangle is :" + fig.area());
        fig = t;
        System.out.println("Area of triangle is :" + fig.area());
    }
}
```

Quiz

What will be the output for the below code ?

```
class Gbase{
public abstract void testBase();
}

public class Sample extends GBase{
    public static void main() {
        Sample ob = new Sample();
        ob.testBase();
    }
}
```

Quiz(Contd.).

What will be the output for the below code ?

```
class abstract GBase{
public void testBase(){
System.out.println("Hello World");
}
}

public class Sample extends GBase{
    public static void main() {
        GBase ob = new GBase();
        ob.testBase();
    }
}
```





Thank You

