Classes and Objects in Java

Parameter Passing, Delegation, Visibility Control, and Object Cleanup

Contents

Static Method in Circle class

- Like *class variables*, can have *class methods* too:

```
public class Circle {

    //A class method for the same
    public static Circle bigger(Circle a, Circle b) {
        if (a.r > b.r) return a; else return b;
    }
}
```

- Accessed with class name

```
Circle c1= new Circle();
Circle c2 = new Cricle();
Cricle c3 = Cricle.bigger(c1,c2);
```


Static Methods in Circle Class

- Class methods can only access static variables and methods.

```
public class Circle {
    // class variable, one for the Circle class, how many circles
    private static int numCircles = 0;
    public double x,y,r;
    public static void printNumCircles(){
        System.out.println("Number of Circles = "  + numCircles);
    }
    // This is not VALID
    public static void printRadius(){
    {
        System.out.println("Radius = " +  r);
    }
}
```


Back to HelloWorld [System invokes static main method]

```
//  HelloWorld.java: Hello World program
class HelloWorld
{
    public static void main(String args[])
    {
      System.out.println("Hello World");
    }
}
```


Back to Constants [final can also be made as static]

```
class SquaredNumbers{

    static final int MAX_NUMBER = 25;
    public static void main(String args[]){
        final int MAX_NUMBER = 25;
        int lo = 1;
        int squared = 0;
        while (squared <=  MAX_NUMBER){
            squared = lo * lo;     // Calculate square
            System.out.println(squared);
            lo = lo + 1;        /* Compute the new  lo value */
        }
    }
}
```

Parameter passing

- Method parameters which are objects are passed by reference.
- Copy of the reference to the object is passed into method, original value unchanged.

Parameter passing - Example

```
public class ReferenceTest {
   public static void main (String[] args)
   {
      Circle c1 = new  Circle(5, 5, 20);
      Circle c2 = new Circle(1, 1, 10);
      System.out.println ( “c1 Radius = “ + c1.getRadius());
      System.out.println ( “c2 Radius = “ + c2.getRadius());
      parameterTester(c1, c2);
       System.out.println ( “c1 Radius = “ + c1.getRadius());
       System.out.println ( “c2 Radius = “ + c2.getRadius());
   }

    …….. cont
```


Parameter passing - Example

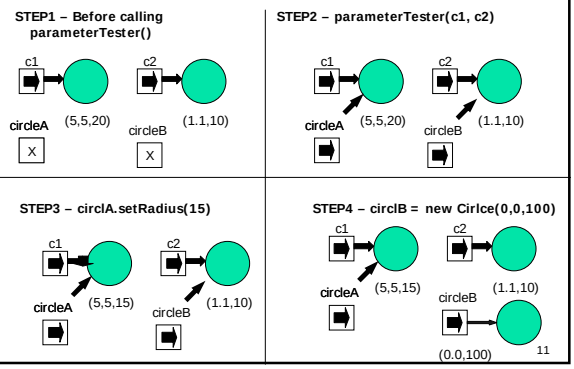
```
   public static  void  parameterTester(Circle circleA, Circle circleB)
   {
       circleA.setRadius(15);
       circleB = new Circle(0, 0, 100);

      System.out.println ( “circleA Radius = “ + circleA.getRadius());
      System.out.println ( “circleB Radius = “ + circleB.getRadius());
   }

}
```


Parameter passing - Example

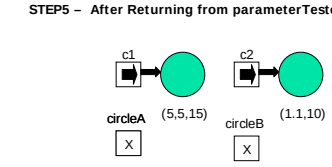
- Output –

```
c1 Radius =  20.0
c2 Radius =  10.0

circleA Radius =  15.0
circleB Radius =  100.0

c1 Radius =  15.0
c2 Radius =  10.0
```


Parameter passing - Example



Parameter passing - Example

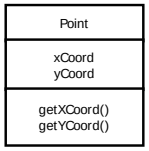


Delegation

- Ability for a class to delegate its responsibilities to another class.
- A way of making an object invoking services of other objects through containership.

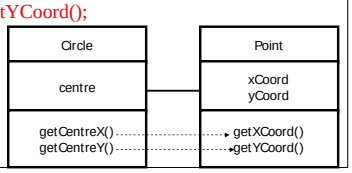
Delegation - Example

```
public class Point {
    private double xCoord;
    private double yCoord;
    // Constructor
        ……….

    public double getXCoord(){
        return xCoord;
    }
    public double getYCoord(){
        return yCoord;
    }
}
```



Delegation - Example

```
public class Circle {
    private Point centre;
    public double getCentreX(){
        return centre.getXCoord();
    }
    public double getCentreY(){
        return centre.getYCoord();
    }
}
```



Visibility Control: Data Hiding and Encapsulation

- Java provides control over the *visibility* of variables and methods, *encapsulation,* safely sealing data within the *capsule* of the class
- Prevents programmers from relying on details of class implementation, so you can update without worry
- Helps in protecting against accidental or wrong usage.
- Keeps code elegant and clean (easier to maintain)

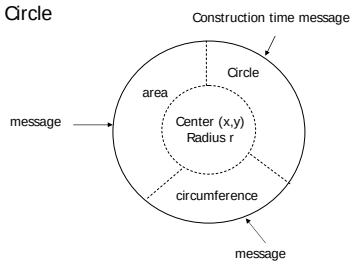
Visibility Modifiers: Public, Private, Protected

- *Public* keyword applied to a class, makes it available/visible everywhere. Applied to a method or variable, completely visible.
  - Default (No visibility modifier is specified): it behaves like public in its package and private in other packages.
- *Default Public* keyword applied to a class, makes it available/visible everywhere. Applied to a method or variable, completely visible.
- *Private* fields or methods for a class only visible within that class. Private members are *not* visible within subclasses, and are *not* inherited.
- *Protected* members of a class are visible within the class, subclasses and *also* within all classes that are in the same package as that class.

Visibility

```
public class Circle {
    private double x,y,r;

        // Constructor
    public Circle (double x, double y, double r) {
            this.x = x;
            this.y = y;
            this.r = r;
    }
    //Methods to return circumference and area
    public double circumference() { return 2*3.14*r;}
    public double area() { return 3.14 * r * r; }
}
```

Visibility



Accessors – "Getters/Setters"

```
public class Circle {
    private double x,y,r;

    //Methods to return circumference and area
    public double getX() { return x;}
    public double getY() { return y;}
    public double getR() { return r;}
    public double setX(double x) { this.x = x;}
    public double serY(double y) { this.y = y;}
    public double setR(double r) { this.r = r;}

}
```

More on "Visibility" during Inheritance and Package Discussion

Objects Cleanup/Destructor

- Unlike c and c++, memory deallocation is automatic in java, don't worry about it
  - no dangling pointers and no memory leak problem.
- Java allows you to define *finalizer* method, which is *invoked* (if defined) just before the object destruction.
- In way, this presents an opportunity to perform record-maintenance operation or cleanup any special allocations made by the user.

```
//          done with this circle
protected void finalize() throws IOException {
          Circle.numCircles = Circle.numCircles--;
          System.out.println("number of circles:"+ Circle.num_circles);
}
```


Summary

- Static members play a role similar to the global members of classes. They can only access other static members in the class.
- Objects can be passed as parameters and they can be used for exchanging messages (data).
- Delegation enables an object to pass responsibilities to other objects.
- Encapsulation/Data hiding helps in protecting data from accidental or wrong usage and also offers better security for data.
- Java clean-ups object resources automatically, however, users can provide "finalize()" method to do any user-level related clean-up activities.