

Introduction: Shadowed (hidden) Fields

Fields become shadowed when a constructor or method contains a declaration of a parameter or local variable with the same name as the field.

Use the reserved word **this** to reference the field instead of the parameter or local variable.

1. What is output by the code fragment given the class definition of **Shadow**?

```
// Code Fragment
Shadow shadow = new Shadow();
shadow.Shadow();
System.out.println( shadow );
```

```
public class Shadow {

    private int shadow = 1;
    private final int N;
    private int m;

    public Shadow() {
        N = shadow;
    }

    public void Shadow() {
        int shadow = 2;
        shadow = shadow;
    }

    public String toString() {
        return N + ": shadow = " + shadow;
    }

}
```

2. Draw the Object (memory) diagram of the memory allocation during the program in the previous question's execution.

3. What is output by the code fragment given the class definition of `Shadow`?

```
// Code Fragment
Shadow shadow = new Shadow(3);
System.out.println( shadow );
```

```
public class Shadow {

    private int shadow = 1;

    public Shadow(int shadow) {
        shadow = shadow;
    }

    public String toString() {
        return "shadow = " + shadow;
    }

}
```

4. What is output by the code fragment given the class definition of `Shadow`?

```
// Code Fragment
Shadow shadow = new Shadow(3);
shadow.Shadow();
System.out.println( shadow );
```

```
public class Shadow {

    private int shadow = 1;

    public Shadow(int shadow) {
        this.shadow = shadow;
    }

    public void Shadow() {
        int shadow = 2;
        this.shadow = shadow;
    }

    public String toString() {
        return "shadow = " + shadow;
    }

}
```

5. What is output by the code fragment given the class definition of `Shadow`?

```
// Code Fragment
Shadow shadow = new Shadow();
System.out.println( shadow );
```

```
public class Shadow {

    private static int shadow = 1;

    private final int N;

    public Shadow( int shadow ) {
        N = this.shadow;
        this.shadow = shadow;
    }

    public Shadow() {
        this(5);
    }

    public String toString() {
        return N + ": shadow = " + shadow;
    }
}
```

6. **FIXED 11-13-15** What is output by the code fragment given the class definition of `Shadow`?

```
// Code Fragment
int n = 0;
Widget [][] wa;
wa = new Widget[10][];

for ( int i=0; i < wa.length; i++ ) {
    wa[i] = new Widget[i];
    for ( int j=0; j < wa[i].length; j++ )
        wa[i][j]=new Widget("W_"+i+"_"+j,n);
}

System.out.println( wa[2][1].getName() );
System.out.println( wa.toString() );
System.out.println( wa[4].length );
System.out.println( wa[3][0].getPassCode().charAt(2) );
System.out.println( wa[5][1].getName() );
System.out.println( wa[5][1].getPassCodeArray()[2] );
```

```
import java.util.Arrays;
public class Widget {
    public final String name;
    public final long id;
    private char [] passcode;
    public Widget( String s, long id ) {
        name = s; this.id = id; passcode = new char[4];
        for ( int i=0; i < passcode.length; i++ )
            passcode[i] =
                (char)('A'+(int)(Math.random()*26));
    }
    public String getName() { return name; }
    public char[] getPassCodeArray() {
        return passcode;
    }
    public String getPassCode() {
        return Arrays.toString(passcode);
    }
}
```

7. Draw the Object (memory) diagram of the memory allocation during the program in the previous question's execution.

8. What happens when you copy an array of references?

```
// Code Fragment
Widget [] s = wa[3];
Widget w = wa[3][2];

System.out.println( s.toString() );
System.out.println( w.getPassCode() );
```

```
import java.util.Arrays;
public class Widget {

    public final String name;
    public final long id;
    private char [] passcode;

    public Widget( String s, long id ) {
        name = s;
        this.id = id;
        passcode = new char[4];
        for ( int i=0; i < passcode.length; i++ )
            passcode[i] = (char)('A'+(int)(Math.random()*26));
    }

    public String getName() {
        return name;
    }

    public char[] getPassCode() {
        return passcode;
    }

    public String getPassCode() {
        return Arrays.toString(passcode);
    }
}
```

9. How would you make copies of all instances?