

## 1999 Paper 10 Question 2

### Foundations of Programming

Distinguish between the keywords `final`, `finally` and `finalize`. Include in your account brief explanations of *exception handling* and *garbage collection*. [7 marks]

The following Java program compiles and runs without complaint. Explain briefly what happens and give the four lines of output in full. [3 marks]

```
public class BoxTest
{
    public static void main(String[] args)
    {
        Square jack = new Square(8);
        Square jill = new Square(12);
        System.out.println("jack's details: " + jack);
        System.out.println("jill's details: " + jill);
        System.out.println("Number of squares: " + Square.total);
        jack = jill;
        System.out.println("Number of squares: " + Square.total);
    }
}

class Square
{
    public static int total = 0;
    private int sqNum = 0;
    private int edge;

    public Square(int n)
    {
        this.sqNum = ++total;
        this.edge = n;
    }

    public String toString()
    {
        return "Square " + sqNum + ", edge size " + this.edge;
    }
}
```

Explain why the output would be different if `edge` were declared `static`. [3 marks]

A naïve interpretation of the assignment `jack = jill` is that the number of `Square` objects is reduced by one. For this loss to be reflected by the last `println` statement it is necessary to augment class `Square` with an extra method which incorporates the statement `this.total--`. Provide such a method. [3 marks]

It is unlikely that supplying this extra method will, of itself, cause the last `println` statement to reflect the reduction in the value of `total`. Modify the method `main()` to delay execution of this statement by one second. It may be assumed that Java 1.1 is being used. [4 marks]