Please fill in your Student Number and, optionally, Name.

Student Number : _____

Name : _____

University of Cape Town ~ Department of Computer Science

Computer Science 1015F ~ 2007

Theory Test 3A

Question	Mark	Max	Initials
1		10	
2		10	
3		4	
4		4	
5		2	
TOTAL		**30**	

Marks : 30

Time : 40 minutes

Instructions:

a) Answer all questions.

b) Write your answers in the space provided.

c) Show all calculations where applicable.

Question 1: OOP Concepts. [10]

a) What is a constructor? [2]

b) Are constructors absolutely necessary? Discuss briefly. [2]

c) Why is information hiding important? [2]

d) How does Java support information hiding? [2]

e) Discuss one advantage of using a wrapper class. [2]

Question 2: Class Definitions [10]

Consider the following class definition and answer the questions that follow.

```
class Complex
{
   private double real;
   private double imaginary;

   public Complex ( double r, double i )
   {
      real = r;
      imaginary = i;
   }
   public Complex ( double r )
   {
      real = r;
      imaginary = 0;
   }

   public double getReal ()
   {
      return real;
   }

   public String toString ()
   {
      if (Math.abs (imaginary) > 0)
      {
         if (imaginary < 0)


            return "" + real + imaginary + "i";
         else
            return real + "+" + imaginary + "i";
      }
      else
         return "" + real;
```

```
    }
}
```

a) Write a statement to create a variable of this type and assign to it an object corresponding to the complex number 1 + 2i. [2]

b) Write an accessor for the instance variable named **imaginary**. [3]

c) Why do we not need to instantiate the **Math** class before using the **abs** method? [1]

d) Write a method to square the current object, overwriting its previous values. (Hint: Remember that *i* is the square root of -1) [4]

Question 3: Classes & objects [4]

You are given the following code fragment. What is the output? [4]

```
public class Data
{
   private String name;
   double number;

   public void set (String test, double val)
   {
      name = test;
      number = val;
   }

   public void whatHappens(double val)
   {
      val = this.number;
      System.out.println ("in whatHappens; "+ val);
   }

   public void doWhat (Data dd)
   {
      dd.number = this.number;
   }
}


class test
{
   public static void main(String[] args)
   {
        Data holder1 = new Data();
        Data holder2 = new Data();

        holder1.set ("Test1", 15.73);
        holder2.set ("Test2", 71.5);

        double val = 81.2;
        holder1.whatHappens(val);

        System.out.println ("in Main val = "+ val);

        holder2.doWhat(holder1);
        System.out.println ("in Main holder1.number = "+
          holder1.number);
        System.out.println ("in Main holder2.number = "+
          holder2.number);
```

```
    }
}
```

Question 4: Classes & Copying [4]

You are given the following code fragments:

```
public class Date
{
   private String month;
   private int day;
   private int year;
   …
}

public class Lady
{
   private Date marriage;
   …
}
```

You are also given the constructor:

```
public Lady(Lady original)
{
   marriage = original.marriage;
}
```

a) What type of copy does this illustrate? [1]

b) Is it a safe copy? [1]

c) Why? [1]

d) Change the code to make it safe (if it is unsafe) or vice-versa? [1]

Question 5: Programming Style [2]

"Comments" are considered important in a computer program. They are helpful to two important types of people. Who are they?