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

Student Number : _____

Name : _____

University of Cape Town ~ Department of Computer Science

Computer Science 1015F ~ 2007

Supplementary 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 overloading? [2]

b) Briefly discuss one advantage of overloading. [1]

c) What is encapsulation? Why is it important? [2]

d) Explain the purpose of each of the 3 modifiers typically used for constant declarations. [3]

e) Why can a static method not call a non-static method? [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 real number 42, using the most efficient overloaded constructor. [2]

b) Write a mutator for the instance variable named **imaginary**. [3]

c) Explain exactly what the output of this **toString** method is. [2]

d) Write a method to add another **Complex** object to the current one. Assume the existence of appropriate accessors. [3]

Question 2: Classes & Objects [4]

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

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

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

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

   public void doWhat (Data dd)
   {
      dd.value = this.value;
   }
}
class test
{
   public static void main(String[] args)
   {
        Data holder1 = new Data();
        Data holder2 = new Data();

        holder1.set ("Eval1", 77.3);
        holder2.set ("Eval2", 61.6);

        double val = 49.8;
        holder2.whatHappens(val);

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

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

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 Man
{
   private Date marriage;
   …
}
```

You are also given the constructor:

```
public Man(Man first)
{
   marriage = new Date(first.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]

Give two good reasons as to why you should sensibly comment a computer program.