1.00 Introduction to Computers and Engineering Problem Solving
Quiz 1 – March 4, 2005

Name: **E-mail Address:** **TA:** **Section:**	

You have 80 minutes to complete this exam. For coding questions, you do not need to include comments, and you should assume that all necessary files have already been imported.

Question 1. True/False

Answer the following questions about Java by circling TRUE or FALSE as appropriate.

1) Two classes in the same package can access each other's *private* variables as `object.variableName`, `where object` is an instance of the other class, and `variableName` is a private variable of that object

TRUE FALSE

2) The following piece of code will compile

```
double a   = 5.5;
double b   = 6.9;
int    sum = a+b;
```

TRUE FALSE

3) Consider the following lines of code

```
int i=6;
int j=5;
double result = i/j + i%j;
```

The value stored in variable `result` is `2.2`

TRUE FALSE

4) A class constructor may return an `int`

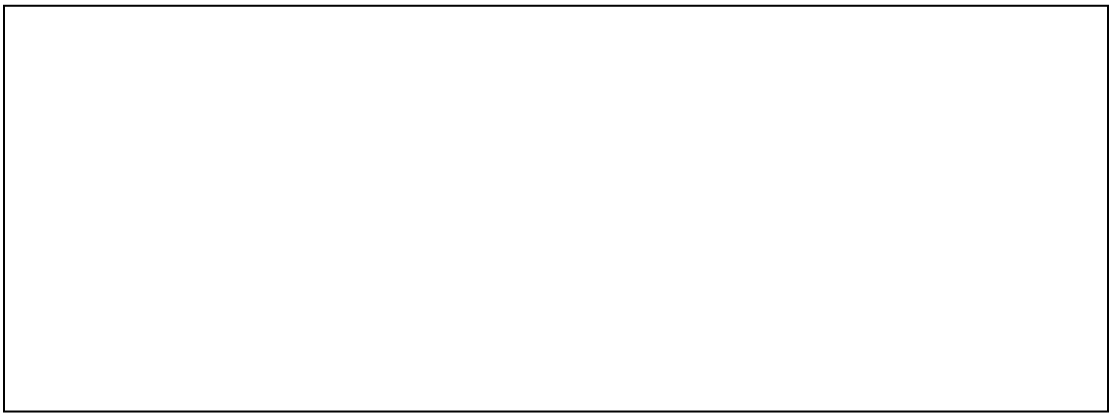
TRUE FALSE

Question 2: Methods

In the code provided below, `MyInt` is a class with a single private variable `value`. Another class `Tools` has a static method `addIt()` which adds two integers, stores the value as an object of type `MyInt` and returns the `MyInt` object. The class `Test` contains a main method.

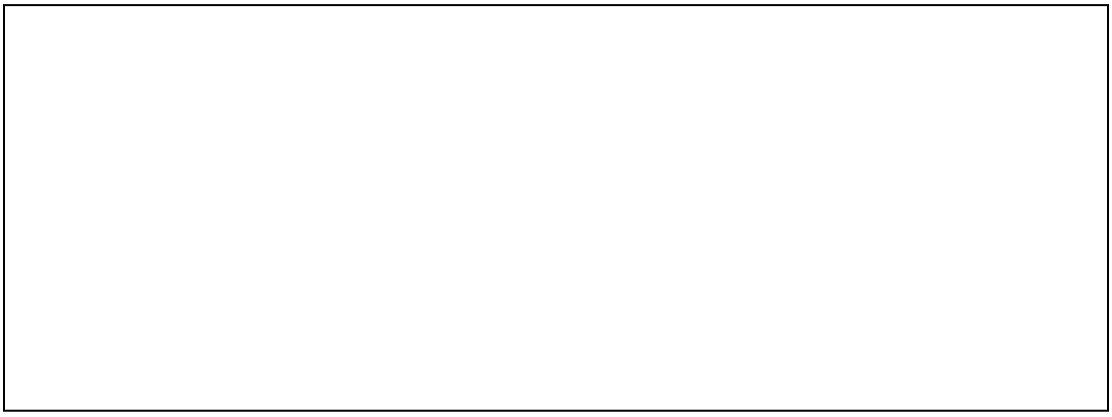
a. Complete the method `addIt()` of the class `Tools`.
b. Write a `main`() method in class `Test` that initializes two integers to the values 5 and 77, calls `addIt`() appropriately, and prints the `MyInt` that is returned, using the method provided.

```
public class MyInt{

      private int value;

      public MyInt(int x){
            value = x;
      }

      public void printIt() {
            System.out.println("MyInt: "+value);
      }
}


public class Tools{

    // Adds two integers x and y, stores the result as an object of type MyInt
    // and returns that object

     public static MyInt addIt(int x, int y){

      }
```



```
}
```

```
public class Test{
    // Initializes two integers 5 and 77, calls addIt and prints MyInt result
     public static void main(String[] args){
```



```
      }
}
```

Question 3: Control Structures

What is the output of this code? Write your answer below.

```
public class MyCode {

     public static void main(String[] args) {
          boolean b = true;
          int k = -2;
          int m = 1;
          while (b) {
               k += k + m++;
               if (k > 10 || m >= 5)
                    break;
          }
          System.out.println(" k = " + k);
          System.out.println(" m = " + m);
     }
}
```

The output is:

Question 4. Constructors

Consider the following Window class and answer the following questions.

```
public class Window {

      private String title;                  // caption of the window
      private static int OpenedWindows;    // number of opened windows
      private static int RemainingMemory;// bytes
      private static int DEFAULT_MEMORY = 256000; // bytes

      // Memory used per window (bytes)
      private static int MEMORY_CONSUMPTION = 50000;

      public Window(String name) {
            title= name;
      }
}
```

Add code to the constructor so that

1. Every time a new Window object is created, the number of opened windows, `OpenedWindows` is incremented by one.
2. The current system memory `RemainingMemory` is updated so that
   i. When there are no instances of Window, system memory equals DEFAULT_MEMORY
   ii. Each Window instance consumes MEMORY_CONSUMPTION bytes. If RemainingMemory would become less than zero, increment it by DEFAULT_MEMORY so that it is greater than zero

```
public Window(String name)
{

      title= name;









}
```

Question 5: Classes and Methods

The Quest for Phi, the Golden Ratio

You have been hired as the computer consultant for the new Indiana Jones movie which is secretly under production. Your job is to write the code that the young Dr. Jones will run on screen in a seemingly intelligent fashion. The purpose of the code is to discover the Golden Ratio, 1.618…, which also happens to be the rate at which the numbers in the Fibonacci sequence increase.

0 1 1 2 3 5 8 13 ..

The 0th term in the Fibonacci sequence is 0, the 1st term is 1. The nth term of the sequence is the sum of the two preceding, or (n-1) and (n-2) terms. For example, the 6th term, 8, is the sum of the 5th and 4th terms: 8 = 5 + 3

The Golden Ratio phi is the value that the nth term divided by the (n-1) term converges to
i.e., the limit of the series,

2/1, 3/2, 5/3, 8/5, 13/8, 21/13, ...

We have written a skeleton class called Fibonacci for you. You will write methods to calculate the Fibonacci number and the Golden Ratio.

a. Write a public static method called `fibonacci`. This method takes an integer n as its argument and returns the nth Fibonacci number

```
public static _____________________________________________
{
   // Declare any variables you need here




 if(n == 0)
      return 0;   //If the argument n is 0, return the 0th Fibonacci number

   else if(n == 1)
      return 1;   //If the argument n is 1, return the 1st Fibonacci number

// For  n greater than 1, calculate the nth Fibonacci number using a loop  and return it









}  //end of method
```

b. Write a public static method `goldenRatio()` which takes in as its argument a number n, and prints the ratio of the n+1 st Fibonacci number to the nth Fibonacci number. This method should not return anything. **Your code should deal with the special case when n = 0 by printing that the ratio cannot be computed in that case.**