

ECE122 Introduction to ECE II

Spring 2007
1st Midterm Examination
(120 minutes, closed book)

NAME: _____

Student ID: _____

Note that any questions on writing code must be answered using Java topics covered in lectures 1-6.

Question	Score
1 (20 points)	
2 (20 points)	
3 (10 points)	
4 (20 points)	
5 (15 points)	
6 (15 points)	
Total (100 points)	

1. (20 points) Write a class called **Wrench** that has the following characteristics:

- The class contains two private variables: an integer **length** representing the length of the handle in centimeters, and a double **size** representing the size of the nut that it can turn.
- The class includes a constructor that takes an integer and a double as parameters and uses these parameters to initialize the class variables.
- The class includes a method **ConvertLength** that takes the integer value of length as a parameter, converts the value to a float, multiplies the value by 2.54 and returns the float result.
- The class contains a main method which creates a **Wrench** object, initializes **length** to 2 and **size** to 3.4, calls the **ConvertLength** method, and prints out the result.

```
public class Wrench
{

    private int length ;
    private double size;

    // Write a constructor that takes two parameters and initializes
    // the class variables to the values in the parameters.

    public Wrench(int length1, double d)
    {
        length = length1;
        size = d;
    }

    // ConvertLength method here
    public float ConvertLength( int len)
    {
        float f ;
        f = (float)len;
        f = (float)(f * 2.54);
        return f;
    }
}
```

```
// Write your main method here
public static void main(String args[])
{
    float a;
    Wrench wrench1 = new Wrench(2,3.4);

    // Call the ConvertLength method

    a = wrench1.ConvertLength(Wrench1.length);
    System.out.println(a);

}
}
```

2. (20 points)

a) (10 points) Write a class **student** that contains two *private* variables, an integer, **student_id** and a float, **grade**. The class also contains accessor and mutator methods that get and set the values of **student_id** and **grade**. Write this code in the following space.

```
import java.util.* ;
public class student
{
    private int student_id;
    private float grade;

    public void SetStudentId( int id)
    {
        student_id = id;
    }

    public int GetStudentId()
    {
        return student_id;
    }

    public void SetStudentGrade ( float grade1)
    {
        grade = grade1;
    }

    public float GetGrade ( )
    {
        return grade;
    }
}
```

b) (10 points) Write a main method that creates an instance of the class **student**. The method then reads two values from the keyboard and assigns the values to **student_id** and **grade** using the mutators. Finally, the accessors are used to read the values and print them out. Include your code below.

```
// Write your main method here
public static void main(String args[])
{

    // Create an instance of student class

    student student1 = new student();
    Scanner input = new Scanner(System.in);

    student1.SetStudentId( input.nextInt( ));
    System.out.println(student1.GetStudentId( ));

    student1.SetStudentGrade( input.nextFloat( ));
    System.out.println(student1.GetGrade( ));

}
}
```

3. (10 points)

a. (6 points) Create a method **adder**, that takes in three float values **f1**, **f2**, and **f3** as parameters and returns the average of the three numbers as an integer.

```
public int adder ( float f1, float f2, float f3 )
{
    int average;
    average = (int)(f1 + f2 + f3 )/3;
    return average ;
}
```

b. (4 points) What is a narrowing conversion ? Did you have to perform a conversion in part a ? If yes, where?

Narrowing conversions convert a large data type into a smaller one (such as int to short) . They can result in information loss.

In part (a) there was a need to perform a narrowing conversion in the step where the calculated average of f1, f2, f3 is assigned to the integer variable “average”

4.(20 points) Please write the following two classes.

a) (10 point) The LightBulb class includes one private variable: an integer **watts** representing how much energy the light bulb consumes. It also includes a set method **SetWattage** and get method **GetWattage** for the **watt** variable. Please write the LightBulb class below.

```
public class LightBulb
{
    int watts;

    public void SetWattage ( int w)
    {
        watts = w;
    }
    public int GetWattage()
    {
        return watts;
    }
}
```

b) The **Problem4** class contains a main method that creates an instance of the `LightBulb` class. From the main method in the class, set the wattage of the bulb to 100. Then use the `GetWattage` method to print the value of wattage. Write the **Problem4** class below.

```
public class Problem4
{
    public static void main ( String args[])
    {
        LightBulnb bulb1 = new LightBulb();
        bulb1.SetWattage (100);
        System.out.println(bulb1.GetWattage( ));
    }
}
```

5. (15 points) The following is a class called **Coin** that emulates a coin. Coin contains a method called **flip** , which when called, returns an int. The integer value returned is the remainder of a random number between 0 and 9 that has been divided by 2.

a) (8 points) Write the code in the space below to implement the above described function for class **Coin**

```
import java.util.Random;
```

```
public class coin
```

```
{
```

```
    public int flip()
```

```
    {
```

```
        int num;
```

```
        // Create an object which will generate a random number between 0 and 9
```

```
        Random rand = new Random();
```

```
        num = (rand . nextInt(10) % 2);
```

```
        return num;
```

```
    }
```

```
}
```

b) (7 points) Complete the class **Problem5** , by using the **Coin** object in (a). The main method of **Problem5** creates two coins, flips the first coin once, the second coin twice, and prints out the result of all the flips.

```
public class Problem5
{
    public static void main(String args[])
    {
        int value1, value2,value3;
        Coin coin1 = new Coin();
        value1 = coin1.flip();
        Coin coin2 = new Coin();
        value2 = coin2.flip();
        value3 = coin2.flip();

        System.out.println(value1);
        System.out.println(value2);
        System.out.println(value3);

    }
}
```

6. (15 points)

(a) (3 points) Will this program compile correctly? If no, what is wrong with it?

```
public class class1
{
    public static void main (string args[])
    {
        final int NUMBER = 10;
        NUMBER = 20;
    }
}
```

No, the program will not compile properly. The “final “ modifier is used to declare a constant . The compiler issues an error if we try to change the value of a constant

(b) (3 points) In the following declaration , what value is stored in teststr ? The memory map is shown below.

String teststr = new string(“Hello”); **teststr contains 1050**

H	1050
e	1051
l	
l	
o	

(c) (3 points) Given the declaration of name as shown below, what value is returned by each method call? (Write your answer next to the method call)

```
String name = "anne-boleyn";
```

```
name.indexOf('b'); 5
```

```
name.length(); 11
```

(d) (3 points) Create an object of the Integer Wrapper class. How is this different from a primitive datatype ? (Hint : Think of the memory map)

```
Integer int1 = new Integer(10);
```

This creates an Integer object which represents the value 10 as an object.

Wrapper classes are different from primitive data types because they use references unlike primitive data types.

(e) (3 points) Write a statement that calculates the square root of the absolute value of a double variable x.

```
public static void main (string args[])
{
    double x;
    // Write your statement here
    Math.sqrt( Math.abs(x));
}
```