

ECE122 Introduction to ECE II
Spring 2008

1st Midterm Examination Solution Set
(120 Minutes, closed book)

Name: _____ **SOLUTION SET** _____

Student ID: _____

Question	Score
1 (10)	
2 (16)	
3 (15)	
4 (22)	
5 (17)	
6 (20)	

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

1. (10 points) Write a method `myCalculate` which takes three integer values `x`, `y` and `z` and returns an integer `retValue`. The value `retValue` is calculated as follows:

$$\text{retValue} = (x*y)/z$$

```
public int myCalculate(int x,int y,int z)
{
    int retValue;
    retValue = (int)((x*y)/z);
    return retValue;
}
```

2. (16 points) Create a class called **PlayingCard** that emulates a playing card which has a value ranging from 2 to 10 (no Jacks, Aces, etc). **PlayingCard** has a method called **select** which when called, returns an integer. The integer value returned is a random number between 2 and 10.

(a) (8 points) Fill in the code to implement the above described method for class **PlayingCard**.

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

```
public class PlayingCard
{
    Random rand;
```

```
    public PlayingCard()
    {
        // Create random number generator here
        rand = new Random();
    }
```

```
    public int select( )
    {
```

```
        // DO NOT create random number generator here
        int no;
        no = rand.nextInt(9) + 2;
        return no;
```

```
    }
}
```

(b) (8 points) Complete the class **Experiment**, by using the **PlayingCard** class in (a). The **main** method of Experiment creates two PlayingCards, selects the first card once and the second card twice. Print out the result of all the selections.

```
class Experiment
{
    public static void main(String args[])
    {

        PlayingCard pcard1 = new PlayingCard();
        PlayingCard pcard2 = new PlayingCard();

        System.out.println("First card first time returned "+pcard1.select());
        System.out.println("Second card first time returned "+pcard2.select());
        System.out.println("Second card second time returned "+pcard2.select());

    }
}
```

3. Assume you are taking three courses as shown in Table 1 during the Spring 2008 semester. The table also shows the score range you are likely to get in the final examination for each of the courses.

Course	Your likely score
ECE 100	A random number between 80 to 90
ECE 101	A random number between 70 to 80
ECE 102	A random number between 90 to 100

Table 1

(a) (7 points) Create a class called **Exam**. Write a method getRandomScore which takes an integer, *minimum_likely_score* and another integer, *maximum_likely_score*. The method returns a random value that is a **short** which has a value between minimum_likely_score and maximum_likely_score.

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

```
class Exam
{
    short score;
    Random rand;

    public short getRandomScore(int minimum_likely_score, int maximum_likely_score)
    {
        // Create random number generator here
        rand = new Random();
        score = (short)(rand.nextInt(maximum_likely_score-minimum_likely_score+1) +
            minimum_likely_score);
    }
}
```

```
        return score;
    }
}
```

(b) (8 points) Complete the class **Test**, by using the Exam object in (a). The main method of Test creates three exams, gets a random score in first exam, second exam and third exam, respectively. Use values in Table 1 for your maximum and minimum likely scores. Add the random scores and print the overall score that you are likely to get.

```
class Test
{
    public static void main(String args[])
    {
        int totalScore = 0;
        Exam e1 = new Exam();
        Exam e2 = new Exam();
        Exam e3 = new Exam();

        totalScore = e1.getRandomScore(80,90) + e2.getRandomScore(70,80) +
            e3.getRandomScore(90,100);

        System.out.println("Total score is "+totalScore);

    }
}
```

(4) (22 points) Write a class called **Hammer** with two private class variables: the **weight** of the head and the **diameter** of the handle. A constructor should initialize the **weight** of the head with a parameter of type double, and it should initialize the **diameter** of the handle with a random integer between 5 and 10 (inclusive of both). Write an accessor and a mutator for the diameter variable, and also write one method to print both class variables.

Write a second class called **Carpenter** with a main method. In this main method, create two Hammers. The head of the first Hammer should have a weight of 4.2, and the second should have a weight specified by the user; use the Scanner class to read the value. Change the diameter of the second Hammer to 8. Lastly, print out the properties of both Hammers.

```
import java.util.*;
import java.lang.*;
```

```
class Hammer
{
    private double weight;
    private int diameter;
```

```

public Hammer(double wt)
{
    Random rand = new Random();
    weight = wt;
    diameter = rand.nextInt(6)+5;
}

//Accessor for diameter
int getDiameter()
{
    return diameter;
}

//Mutator for diameter
void setDiameter(int d)
{
    diameter = d;
}

void printProperties()
{
    System.out.println("Diameter is "+diameter);
    System.out.println("Weight is "+weight);
}

}

class Carpenter
{
    public static void main(String args[])
    {
        double wt;
        Scanner scan = new Scanner(System.in);

        Hammer h1 = new Hammer(4.2);
        System.out.println("Enter second hammer's weight : ");
        wt = scan.nextDouble();
        Hammer h2 = new Hammer(wt);
        h2.setDiameter(8);
        h1.printProperties();
        h2.printProperties();
    }
}

```

5. (a) (12 points) The total distance traveled by a vehicle in t seconds is given by

$$\text{distance} = u*t + (a*t^2)/2$$

where u is the initial velocity (meters/second), a is the acceleration (meters/second²). Assume your vehicle has an initial velocity of 30 meters/second. Write a method **findDistance** that accepts acceleration (float **a**) and time (integer **t**) to evaluate the distance traveled by your vehicle. Also, use a narrowing conversion to approximate the distance to the nearest integer and print the distance.

```
public int findDistance(float a, int t)
{
    int u = 30;
    int distance = 0;
    distance = (int)(u*t+(a*Math.pow(t,2))/2);
    return distance;
}
```

(b) (5 points) Explain in 3 to 4 sentences why the Java language was created. Why is Java an interpreted language?

The Java language was created by James Gosling in June 1991 for use in a set top box project. Initial goals were to implement a virtual machine and a language that had a familiar C/C++ style of notation. The basic philosophy being "Write Once, Run Anywhere" (WORA), providing no-cost runtimes on popular platforms. Java became a popular language for internet because of its platform independency feature. Java was basically created for internet.

Java source code is compiled to an intermediate form called bytecode. Java interprets bytecode (a phase which includes translation as well as execution) to produce the code for the target machine. Hence called an interpreted language.

(6) (a) (8 points) What is the output of the following program? Show all work.

```
public static void main(String args[])
{
    int x,y,z,w;
    int ans1,ans2;
    x=24;
    y=20;
    z=4;
    w=9;
    ans1 = ((x-(y/5)+z)%8)+25;
    ans2 = x-y/5+z%8+25;
    System.out.println("Ans1 is "+ans1+"Ans 2 is "+ans2);
}
```

Ans1 is 25 Ans 2 is 49. This program emphasizes the importance of using parenthesis in your programs.

Reason: Ans1 is 25

$$y/5 = 4$$

$$x-(y/5) = 20$$

$$x-(y/5)+z = 24$$

$$(x-(y/5)+z)\%8 = 0;$$

$$(x-(y/5)+z)\%8+25 = 25$$

Reason: Ans2 is 49

$$y/5 = 4$$

$$z\%8 = 4$$

$$x-y/5+z\%8+25 = 49$$

(b) (7 points) What is the output of the following program? Describe how got the result.

```
Line#
1    class MyJava
2    {
3        public static void main(String args[])
4        {
5            String str1 = "Java is my first ECE class";
6            String str2 = "Java is my second ECE class";
7            str2=str1;
8            str1=str2;
9            System.out.println(str2);
10           System.out.println(str1);
11        }
12    }
```

>Java is my first ECE class

>Java is my first ECE class

Reason : First str2 references str1. Then, str1 references str2 which is nothing but “self reference”. So, both str1 and str2 are referencing “Java is my first ECE class”. Hence the output.

(c) (5 points) Consider the following two programs as shown below. Do you think the two programs will produce the same output ? If yes, why? If no, why not?

Program 1

```
public static void main(String args[])
{
    int a = 3;
    int b = 2;
    System.out.println("Here, a is "+a+" and b is "+b);
    a=a+b;
    b=a-b;
    a=a-b;
    System.out.println("There, a is "+a+" and b is "+b);
}
```

Program 2

```
public static void main(String args[])
{
    int a = 3;
    int b = 2;
    int c;
    System.out.println("Here, a is "+a+" and b is "+b);
    c=a;
    a=b;
    b=c;
    System.out.println("There, a is "+a+" and b is "+b);
}
```

Yes. They would produce the same output.

Program 1

A=a+b . //Now a becomes 5

B=a-b //Now b becomes 3

A=A-b //Now a becomes 2

So essentially values in a and b are swapped.

Program 2

This is just swapping using a temporary variable.