Principles of Programming

Test: Monday 31st January 3.00pm – 4.30pm

Surname (Family Name):

First Name(s):

ID Number:

TUESDAY/WEDNESDAY
    Lab Time:

Note: Attempt **ALL** questions. Calculators are **NOT** permitted.
Write your answers in the spaces provided. There is space at the back for answers that overflow the allotted space. **Questions total 72 Marks**.

Section	Marks	Possible Marks
Q.1		5
Q.2		5
Q.3		8
Q.4		8
Q.5		8
Q.6		4
Q.7		12
Q.8		7
Q.9		5
Q.10		10
Total		72

Question 1 (5 marks)

Have a look at the following HTML source code:

```
<html>
<head><title>Terms Test</title></head>
<body>
<h1>Computer Science</h1>
<hr>
<img src = "101.gif">
<hr>
This <a href = "http://www.cs.auckland.ac.nz/415.101AC">course</a>
is:
<ul>
<li>fun</li>
<li>interesting</li>
</ul>
</body>
</html>
```
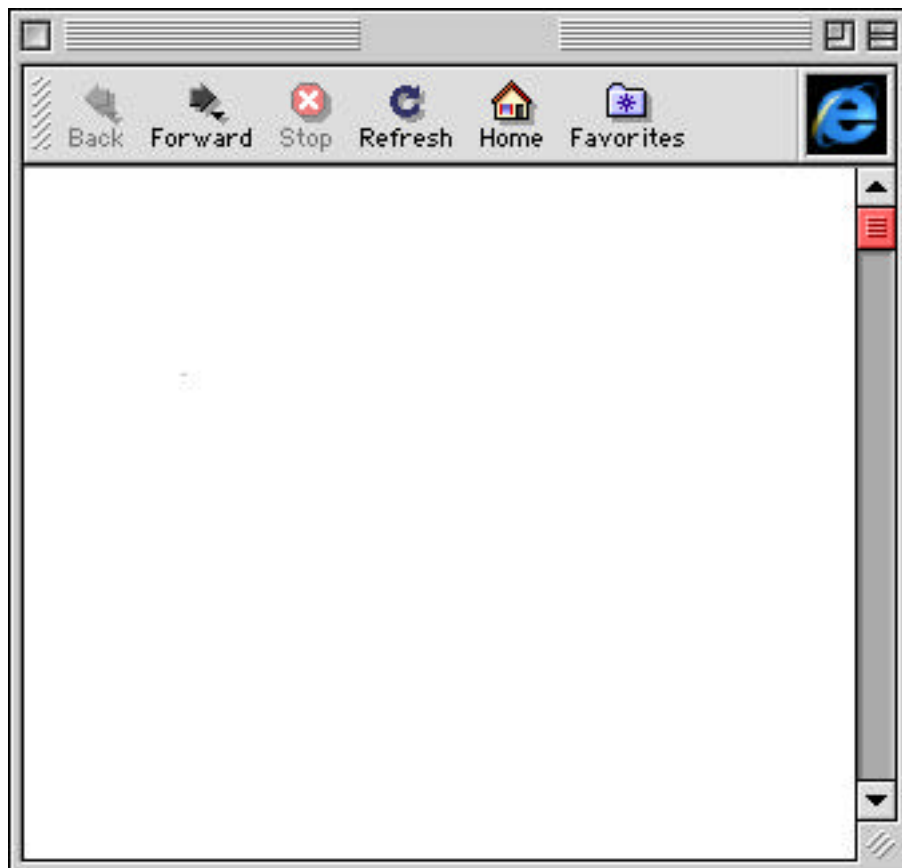
Note: the file 101.gif is a gif image file which looks like this:

Draw the output from the HTML code above in the browser window below:

Question 2 (5 marks)

Rewrite the following program using the standard 415.101 indentation.

```
public class Q2 {
public static void main(String args[]) {
int int1, int2;
System.out.println("Numbers: ");
int1 = Keyboard.readInt();
int2 = Keyboard.readInt();
if (int1 > 62){
System.out.println("OK");
int1 = int1 - 3;
}
else {
int1 = int1 + 10;
if (int1 > int2)
System.out.println(int1 + ", "+ int2);
else {
int1 = int1 - 10;
System.out.println(int1 + ", "+ int2);
}}}}
```

```
public class Q2 {
    public static void main(String args[]) {
        int int1, int2;
        System.out.println("Numbers: ");
        int1 = Keyboard.readInt();
        int2 = Keyboard.readInt();
```

Question 3 (8 marks)

What is the output when the following program is run?

```java
public class Q3 {
   public static void main(String args[]) {
      int int1, int2, int3;
      double double1, double2, double3;
      long long1;

      double1 = 12.0;
      double2 = 5.0;
      int2 = 2;

      int1 = (int)double1 / (int)double2;
      double3 = (6 * (int)double2) / double1;
      long1 = Math.min(int2, (int)Math.pow(1.0, double2));
      int3 = (10 * int2) % (int)double1;

      System.out.println("int1: " + int1);
      System.out.println("int3: " + int3);
      System.out.println("double3: " + double3);
      System.out.println("long1: " + long1);
   }
}
```

Question 4 (8 marks)

What is the output of the following Applet?

```java
import java.applet.*;

public class Q4 extends Applet {

   int a;
   boolean b;
   double c;

   public void init() {
      a = 20;
      b = true;
      c = 1.5;
      first(a);
      c = second() + third(b);
      System.out.println("a is: " + a);
      System.out.println("b is: " + b);
      System.out.println("c is: " + c);
   }

   public void first(int x) {
      a = a * 10;
      b = false;
      System.out.println("a is: " + a);
      System.out.println("x is: " + x);
   }

   public int second() {
      return a;
   }

   public double third(boolean state) {
      if (state)
         return 10.0;
      else
         return c;
   }
}
```

Question 5 (8 marks)

Write a method called `shortThenLong` which takes two Strings as parameters and returns the String which is formed by joining the longer of the two Strings to the end of the shorter of the two Strings. If the Strings are both the same length, then the order in which one String is joined to the other does not matter.

If the following statements were executed:

```
System.out.println(shortThenLong(" Anniversary ", " Happy "));
System.out.println(shortThenLong(" to ", " you "));
```

the output should be:

```
Happy  Anniversary
to  you
```

Question 6 (4 marks)

Do the following boolean expressions evaluate to true or false?

```
int a = 34;
int b = 56;
int c = 62;
```

(a < b) && !(b < c)

(a < b && a >= c) || (c < b)

Question 7 (12 marks)

Complete the following Applet so that it executes as follows: the user types in an x, y value into two TextFields and then presses either the "From Left" or the "From Right" button.

If the user presses the "From Left" button a blue circle (size 30 pixels) is drawn in position x , y of the Applet.

If the user presses the "From Right" button a red circle (size 30 pixels) is drawn x pixels in from the right of the Applet and y pixels down from the top of the Applet. The top left corner of the red circle has to be (x + the size of the circle) pixels in from the right of the Applet (see the example screen shots below). The Applet is 300 pixels in width.
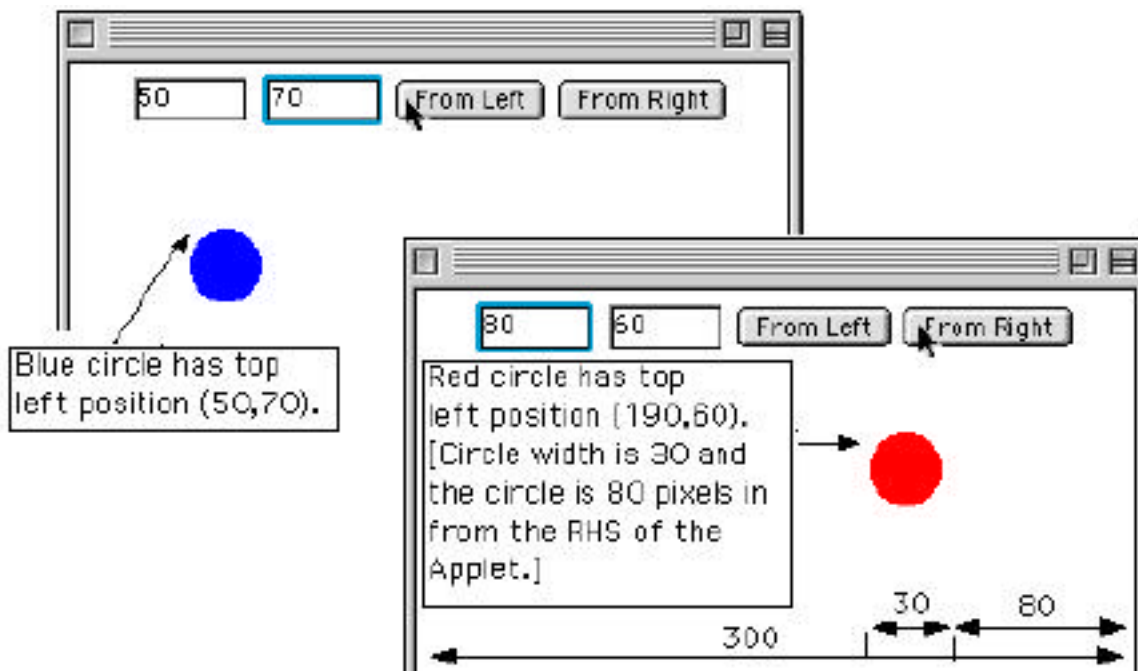
Complete the Applet below:.

```java
import java.awt.*;
import java.applet.*;
import java.awt.event.*;
public class Q7 extends Applet implements ActionListener {
   /** width and height of oval */
 static final int SIZE = 30;
   /** applet width */
 static final int APP_WIDTH = 300;
   /** TextFields to hold x,y position of circle */
 private TextField xPosT, yPosT;
   /** Buttons for drawing circle from Applet left or right */
 private Button fromLeftB, fromRightB;
   /** true if circle is drawn from left of applet */
 private boolean fromLeft;
     /** x,y position of the circle*/
 private int xPos, yPos;
```

```java
public void init() {
   xPosT = new TextField(5);    //set up TextFields and Buttons
   add(xPosT);
   yPosT = new TextField(5);
   add(yPosT);
   fromLeftB = new Button("From Left");
   fromLeftB.addActionListener(this);
   add(fromLeftB);
   fromRightB = new Button("From Right");
   fromRightB.addActionListener(this);
   add(fromRightB);
   xPos = 100;
   yPos = 100;
   fromLeft = false;
 } //end of init() method
  public void actionPerformed(ActionEvent e){
```

```
 }//end of actionPerformed() method
public void paint(Graphics g){
```

```
 }//end of paint() method
}//end of Applet
```

Question 8 (7 marks)

An application program executes as follows: first the user is asked to enter:

The number of items required,
The cost of each item,
The amount inserted by the user.

The program calculates the change:
If the amount of change to be given is $30 or more then the message:
"Wait for cheque: value $…" appears.

If the amount of change is less than $30 then the message:
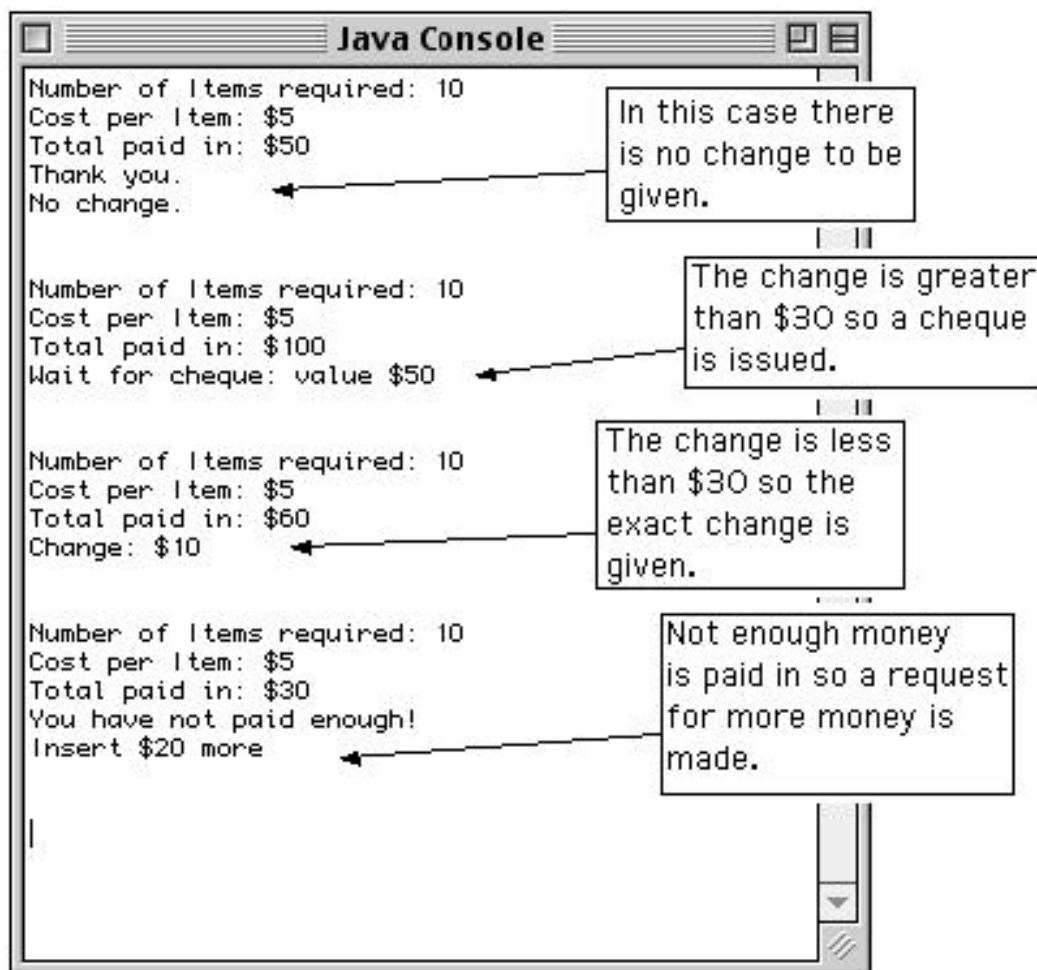"Change: $…" appears..

If there is no change to be given then the program gives the message:
"Thank you. No change."

If the amount inserted by the user is too little the following message appears:
"You have not paid enough! Insert $... More".
(Sample screen shot below.)

```
 ┌─────────────────────────────────────────────────────┐
 │ □ │═══════════ Java Console ═══════════│ 凹 目       │
 ├─────────────────────────────────────────────────────┤
 │ Number of Items required: 10      ┌──────────────────┐
 │ Cost per Item: $5                 │ In this case there│
 │ Total paid in: $50                │ is no change to be│
 │ Thank you.                        │ given.            │
 │ No change.        ◄───────────────┘                  │
 │                                        ┌──────────────┐
 │                                        │The change is greater
 │ Number of Items required: 10           │than $30 so a cheque
 │ Cost per Item: $5                      │is issued.    │
 │ Total paid in: $100                    │              │
 │ Wait for cheque: value $50  ◄──────────┘              │
 │                                   ┌──────────────────┐
 │                                   │The change is less │
 │ Number of Items required: 10      │than $30 so the    │
 │ Cost per Item: $5                 │exact change is    │
 │ Total paid in: $60                │given.             │
 │ Change: $10       ◄───────────────┘                  │
 │                                   ┌──────────────────┐
 │ Number of Items required: 10      │Not enough money   │
 │ Cost per Item: $5                 │is paid in so a request
 │ Total paid in: $30                │for more money is  │
 │ You have not paid enough!         │made.              │
 │ Insert $20 more   ◄───────────────┘                  │
 │                                                       │
 │ |                                                     │
 │                                                       │
 └─────────────────────────────────────────────────────┘
```

Complete the `main()` method so the program behaves as described above.

```java
public class Q8 {
   public static void main(String args[]) {
      int nItems;       // number of items
      int totalPaid;    // total paid by user
      int perItemC;     //cost per item
      int totalC;       //total cost of items
      int change;       //change if there is any
      int need;         //amount needed if user has not paid enough
                        //get user input
      System.out.print("Number of Items required: ");
      nItems = Keyboard.readInt();
      System.out.print("Cost per Item: $");
      perItemC = Keyboard.readInt();
      System.out.print("Total paid in: $");
      totalPaid = Keyboard.readInt();

      totalC = nItems * perItemC;  //work out total Cost
```

```



















```

```
   }
}
```

Question 9 (5 marks)

What is the output from the following program? You can assume that the `paint()` method is executed ONCE only.

```java
import java.awt.*;
import java.applet.*;

public class Q9 extends Applet{
 private String theWord;

 public void init() {
   theWord = "with";

   String theWord;

   theWord = "free";
   theWord = theWord.concat("hold");
   System.out.println(theWord+ " at end of init()");
 }

 public void paint(Graphics g){
   System.out.println(theWord+ " in paint()");
 }
}
```
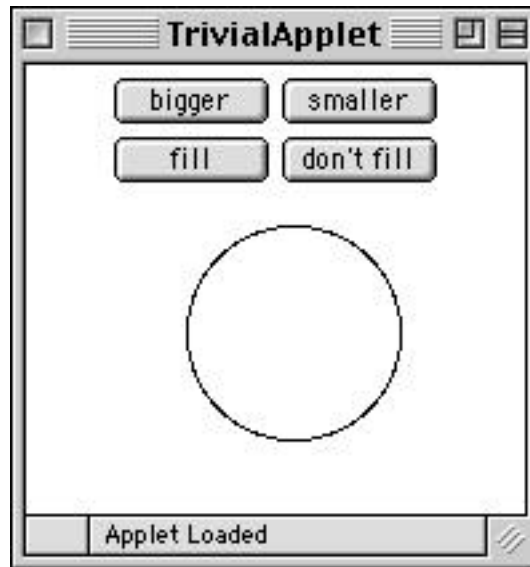
Question 10 (13 marks)

The applet below uses a class called `MyCircle` to draw a circle on the screen. The applet also has four buttons which have the following effect on the circle:

`bigger`: increases the radius of the circle by 10 pixels
`smaller`: decreases the radius of the circle by 10 pixels
`fill`: causes the circle to be drawn filled in rather than in outline
`don't fill`: causes the circle to be drawn in outline

When the applet first runs, the circle should be drawn in outline, rather than filled.

If the user clicks the `bigger` or `smaller` buttons, the size of the circle should change. In the following picture, the user has clicked on the `smaller` button twice:
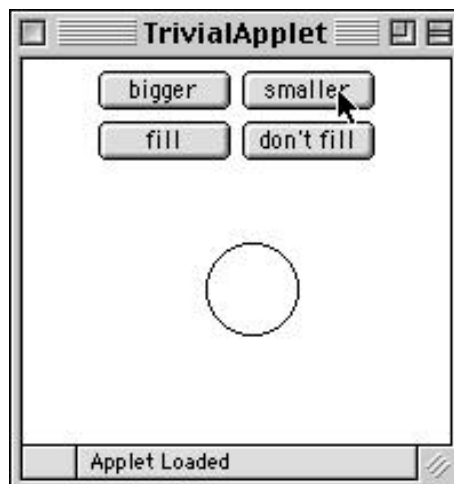
If the user clicks on the `fill` button, the circle should be drawn filled in, and when the user clicks on the `don't fill` button, the circle should be drawn in outline. In the screen shots on the following page, the user has clicked on the `fill` button, followed by a click on the `don't fill` button:
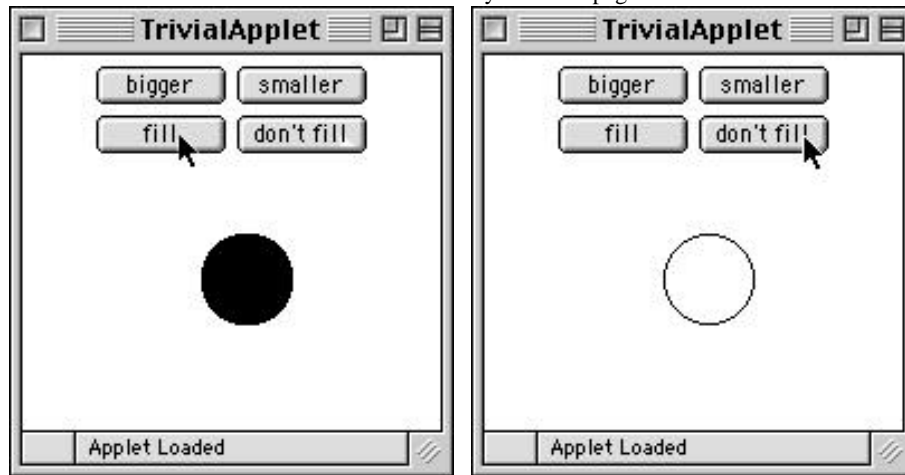
Below is source code for the Applet class which uses the `MyCircle` class:

```java
import java.awt.*;
import java.awt.event.*;
import java.applet.Applet;

public class Q10 extends Applet implements ActionListener {

    MyCircle c;
    Button biggerButton;
    Button smallerButton;
    Button fillButton;
    Button dontFillButton;

    public Button customButton(String label) {
        Button b = new Button(label);
        b.addActionListener(this);
        add(b);
        return b;
    }

    public void init() {
        c = new MyCircle(100, 100, 50);
        biggerButton = customButton("bigger");
        smallerButton = customButton("smaller");
        fillButton = customButton("fill");
        dontFillButton = customButton("don't fill");
    }

    public void actionPerformed(ActionEvent e) {
        if (e.getSource() == biggerButton)
            c.changeSize(10);
        else if (e.getSource() == smallerButton)
            c.changeSize(-10);
        else if (e.getSource() == fillButton)
            c.setFill(true);
        else
            c.setFill(false);
        repaint();
    }

    public void paint(Graphics g) {
        c.draw(g);
    }
}//end of Applet
```

You need to declare appropriate instance variables and complete the methods for the `MyCircle` class.

```java
import java.awt.*;
public class MyCircle {

    private int x;
    private int y;
    private int radius;
    private boolean isFilled;

    public MyCircle(int initX, int initY, int initRadius) {




    }

    public void changeSize(int amount) {




    }

    public void setFill(boolean state) {




    }

    public void draw(Graphics g) {




    }
}//end of Applet
```

Overflow   Sheet

Please indicate the number of the question you are answering.

Overflow   Sheet

Please indicate the number of the question you are answering.

Methods you may find useful

<u>Graphics class</u>
```
      void setColor(Color colour);
      void fillOval(int x, int y, int width, int height);
      void drawOval(int x, int y, int width, int height);
      void drawLine(int x1, int y1, int x2, int y2);
```

<u>Integer class</u>
```
      Int Integer.parseInt(String str);
```

<u>TextField class</u>
```
      String getText();
      void setText(String str);
```