1.124 Quiz 2
Thursday November 9, 2000

Time: 1 hour 20 minutes
Answer all questions. All questions carry equal marks.

Question 1.
Show the steps that are involved in sorting the string SORTME using the quicksort algorithm given below.

```
#include <iostream.h>
void quicksort(char *a, int l, int r);

main() {
    char str[8] = "9SORTME";    // 9 is a sentinel.
    quicksort(str, 1, 6);
}

inline void swap(char *a, int i, int j) {
    char tmp = a[i];
    a[i] = a[j];
    a[j] = tmp;
    cout << a+1 << endl;    // Print out the array, excluding the sentinel.
}

void quicksort(char *a, int l, int r) {
    if (r > l) {
        char v = a[r];
        int i = l - 1;
        int j = r;
        while (1) {
            while(a[++i] < v);
            while(a[--j] > v);
            if (j <= i)
                break;
            swap(a, i, j);
        }
        swap(a, r, i);
        quicksort(a, l, i-1);
        quicksort(a, i+1, r);
    }
}
```

Answer:

```
S O R T M E
```
Question 2.
Show how you would translate the bold portions of the following C++ code into Java.

```
#include <iostream.h>

class Shape {
private:
    float x, y;

public:
    Shape(float a, float b) {
        x = a;
        y = b;
    }

    virtual float compute_area() = 0;

    virtual void print() {
        cout << x << " " << y << endl;
    }
};

class Circle : public Shape {
private:
    float radius;

public:
    Circle(float a, float b, float r) : Shape(a, b) {
        radius = r;
    }

    float compute_area() {
        return 3.14f * radius * radius;
    }

    void print() {
        cout << radius << endl;
        Shape::print();
    }
};

void main() {
    Circle a(3,4,2);
    a.print();
}
```
Question 3.
In the following C++ program, the `outputData()` function can handle callbacks such as `plot()` and `print()`. How would you complete the given Java code to implement a similar capability?

```java
#include <iostream.h>

class Point {
    private:
        int x, y;

    public:
        Point(int a = 0, int b = 0) {
            x = a;
            y = b;
        }

        void print() {
            cout << x << " " << y << endl;
        }
    }

    typedef void (*OutFunc)(Point& p);

    void plot(Point &p) { // Assume that this plots the point p on the screen.
        cout << "In plot:" << endl;
        p.print();
    }

    void print(Point &p) { // Assume that this prints out the coordinates of p.
        cout << "In print:" << endl;
        p.print();
    }

    void outputData(OutFunc pFunc, Point *a, int n) {
        for (int i = 0; i < n; i++)
            pFunc(a[i]);
    }

    void main() {
        Point a[2];
        a[0] = Point(2,3);
        a[1] = Point(4,5);
        outputData(plot, a, 2);
        outputData(print, a, 2);
    }
```
class Point {
    private int x, y;

    public Point(int a, int b) {
        x = a;
        y = b;
    }

    void print() {
        System.out.println(x + ' ' + y);
    }
}

class Plotter
{
}

class Printer
{
}

class Main {
    static void outputData()
    {
    }

    public static void main(String args[]) {
        Point a[] = new Point[2];
        a[0] = new Point(2,3);
        a[1] = new Point(4,5);
        outputData(new Plotter(), a, 2);
        outputData(new Printer(), a, 2);
    }
}
Question 4.
Show how you would complete the given Java code, so that it achieves the effect shown in the Figure below.

Answer:

```java
import java.awt.*;
import javax.swing.*;

class Main {
    public static void main(String args[]) {
        JFrame f = new JFrame();
        f.setSize(250,250);
        f.setVisible(true);
    }
}
```
Question 5.
How you would you change the background color of the panel when the mouse moves over the application’s window?

```java
import java.awt.*;
import java.awt.event.*;
import javax.swing.*;

class Main {
    public static void main(String args[]) {
        JFrame f = new JFrame();
        final JPanel p = new JPanel();
        f.setContentPane(p);
        f.setSize(250, 250);
        f.setVisible(true);
    }
}
```

Answer:

```java
f.setContentPane(p);
f.setSize(250, 250);
f.setVisible(true);
```
Question 6.
The following applet contains several errors. Explain what changes you would make to correct the code, so that the applet displays the current frame number.

Answer:

```java
import java.awt.*;
import javax.swing.*;

public class MyApplet extends JApplet {
    Thread t = null;
    int count = 0;

    public void init() {
        getContentPane().add(new JPanel() {
            public void paintComponent(Graphics g) {
                super.paintComponent(g);
                g.drawString("Count = " + count, 50, 50);
            }
        });
    }

    public void start() {
        t = new Thread();
        t.start();
    }

    public void run() {
        for (int i = 0; i < 200; i++) {
            count++;
            repaint();
            Thread.sleep(100);
        }
    }
}
```
Question 7.
What is double buffering and why is it important in animation? How do the Swing classes differ from the AWT classes in this respect?

Answer:

Question 8.
Show how you would extract the number 1.124 from the string "Hello 1.124 World!" and then store it in a float variable.

Answer: