

OOSD: Practice Problems 4

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

public class Numerals extends JFrame implements ActionListener
{
    private String item = "1";
    private JComboBox combo;
    private JPanel draw;

    Numerals()
    {
        setTitle("Numerals");
        addWindowListener(new WindowAdapter()
        {
            public void windowClosing(WindowEvent e) { System.exit(0); }
        });
        JPanel eastPanel = new JPanel();
        eastPanel.setLayout(new BorderLayout());
        combo = new JComboBox();
        combo.addItem("1");  combo.addItem("2");  combo.addItem("3");
        combo.addItem("4");  combo.addItem("5");  combo.addItem("6");
        combo.addActionListener(this);
        eastPanel.add(combo, "South");
        JPanel jp = new JPanel();
        jp.setLayout(new GridLayout(3,2));
        JButton [] button = new JButton [6];
        for (int m=0; m<button.length; m++)
        {
            button[m] = new JButton("" + (m+1));
            jp.add(button[m]);
            button[m].addActionListener(this);
        }
        eastPanel.add(jp, "Center");
        getContentPane().add(eastPanel, "East");
        draw = new DrawPanel();
        draw.setBackground(Color.cyan);
        getContentPane().add(draw, "Center");
    }

    public void actionPerformed(ActionEvent e)
    {
        Object ob = e.getSource();
        if (ob instanceof JComboBox)
        {
            JComboBox source = (JComboBox)e.getSource();
            item = (String)source.getSelectedItem();
        }
        else if (ob instanceof JButton)
        {
            item = e.getActionCommand();
            for (int k=0; k<combo.getItemCount(); k++)
            {
                String lab = (String)combo.getItemAt(k);
                if (lab.equals(item))  combo.setSelectedIndex(k);
            }
        }
        draw.repaint();
    }
}
```

```

class DrawPanel extends JPanel
{
    public void paintComponent(Graphics g)
    {
        super.paintComponent(g);
        Font font = new Font("Serif", Font.BOLD, 96);
        g.setFont(font);
        g.setColor(Color.blue);
        g.drawString(item,80,120);
    }
}

public static void main(String [] args)
{
    JFrame jf = new Numerals();
    jf.setSize(300, 200);
    jf.setVisible(true);
}
}

```

- a) Find a command that contains an example of an upcast in the program.
- b) Find a command that contains an example of a downcast in the program.
- c) Find an example of a polymorphic method (one that uses dynamic binding) in the program.
- d) Find one example of an instance variable and one example of an instance method.
- e) What error message appears if the third import statement is omitted?
- f) Draw a picture that shows the frame that appears on the screen when the program starts. Show all its details and indicate the colors that appear.
- g) Suppose the method actionPerformed is completely removed from the program. What changes must be made so that the program will still compile? How does this change the behavior of the program?
- h) Explain the *purpose* of the for-loop inside the actionPerformed method. Describe its purpose in terms of the gui frame on the screen.
- i) What changes must be made if the inner class DrawPanel is made into a top-level class that comes after Numerals?
- j) Explain the anonymous inner class in this program. Where is it? What is its purpose in the place where it appears? How do its various parts contribute to its behavior?
- k) What is the effect of paintComponent in this program and why is it used to draw instead of just using Graphics g = draw.getGraphics?
- l) Explain why draw is declared as an instance variable and eastPanel is declared as a local variable. Could both be instance variables? Could both be local variable?
- m) Explain the two uses of **this** in the program. Be specific.
- n) Add code to the program that places a label "Press a button or choose an item" in the north region of the frame. Indicate where your code will be placed.
- o) Are the two setLayout commands necessary? Why?
- p) What changes must be made if we interchange the positions of the setTitle command and the setSize command?