Java Lab – 9

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1) Write a Java program that works as a simple calculator. Arrange Buttons for digits and the + - * / operations properly. Add a text field to display the result. Handle any possible exceptions like divide by zero. Use Java Swing.

Program code:

```
/*****************************************
 * Calculator implementing the funtions +,-,*,/
 * Done By: Rohit Karunakaran
 * ***************************************/
import java.awt.*;
import java.awt.event.*;
import javax.swing.*;


public class Calculator
{
   JFrame jfrm;
   JLabel disp;
   GridBagConstraints c ;
   ActionListener numberButtonPressed;
   ActionListener mathButtonPressed;
   boolean add;
   boolean sub;
   boolean mul;
   boolean div;
   boolean done;

   double calc;

   public Calculator()
   {
      jfrm = new JFrame("Calculator");
      jfrm.setLayout(new GridBagLayout());
      c = new GridBagConstraints();
      calc = 0;
      add=false;
      sub=false;
      div=false;
      mul=false;
      done = true;

      jfrm.setSize(270,330);
```

```
jfrm.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);

disp = new JLabel(String.valueOf(calc));

numberButtonPressed = new ActionListener()
{
   public void actionPerformed(ActionEvent ae)
   {
      JButton callerButton = (JButton)ae.getSource();
      String val = callerButton.getText();
      String displayText = disp.getText();

      if(displayText.equals("ERROR"))
      {
         disp.setText(val);
      }
      else
      {
         if(done ==true){
               disp.setText(String.valueOf(Double.parseDouble(val)));
         }
         else{
               double newVal = Double.parseDouble(displayText)*10+Double.parseDouble(val);
               disp.setText(String.valueOf(newVal));
            }
      }
      done = false;
   }
};

mathButtonPressed = new ActionListener()
{
   public void actionPerformed(ActionEvent ae)
   {
      //done = true;
      JButton b = (JButton) ae.getSource();
      double result = 0.0;
      String val = disp.getText();
      if(!done)
      {
         if(val.equals("ERROR"))
         {
            disp.setText("0.0");
            calc = 0.0;
         }
         else
         {
            if(add||sub||div||mul)
            {
```

```
                double operand= Double.parseDouble(val);
                if(add)
                {
                   result = calc+operand;
                   add = false;
                }
                else if(sub)
                {
                   result = calc-operand;
                   sub = false;
                }
                else if(mul)
                {
                   result = calc*operand;
                   mul = false;
                }
                else if(div)
                {
                   if(operand!=0.0)
                      result = calc/operand;
                   else{
                      disp.setText("ERROR");
                      done = true;
                      return;
                   }
                   div = false;
                }
                calc = result;
                disp.setText(String.valueOf(calc));

             }
             else
             {
                calc = Double.parseDouble(val);
                char op = b.getText().charAt(0);
                switch(op)
                {
                   case '+':add=true;break;
                   case '*':mul=true;break;
                   case '/':div=true;break;
                   case '-':sub=true;break;
                }
             }

          }
          done = true;
       }
    }
};
```

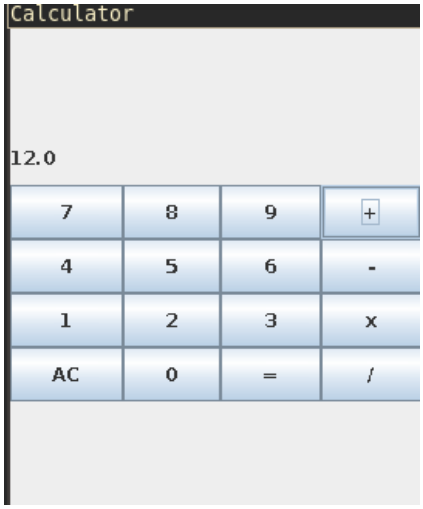
```
    c.anchor = GridBagConstraints.FIRST_LINE_START;
    c.fill= GridBagConstraints.VERTICAL;
    c.weightx=0.5;
    c.gridx=0; c.gridy=0;
    c.gridwidth = 3;
    c.ipady = 20;

    jfrm.add(disp,c);
    addButtons();
    jfrm.setVisible(true);
}

private void addButtons()
{
   c.ipady = 10;
   c.gridwidth = 1;
   c.fill= GridBagConstraints.HORIZONTAL;
   c.anchor = GridBagConstraints.LINE_START;
   JButton numbers[] = new JButton[10];
   for(int i = 0;i<10;i++)
   {
       numbers[i] = new JButton(String.valueOf(i));
       numbers[i].addActionListener(numberButtonPressed);
       if(i!=0)
          c.gridx = (i+2)%3;
       else
          c.gridx = 1;
       c.gridy = i%3==0?4-(i/3-1):4-(i/3);
       jfrm.add(numbers[i],c);
   }
   JButton addButton= new JButton("+");
   addButton.addActionListener(mathButtonPressed);

   JButton subButton= new JButton("-");
   subButton.addActionListener(mathButtonPressed);

   JButton mulButton= new JButton("x");
   mulButton.addActionListener(mathButtonPressed);

   JButton divButton= new JButton("/");
   divButton.addActionListener(mathButtonPressed);

   c.gridx = 3;
   c.gridy = 2;
   jfrm.add(addButton,c);
   c.gridy = 3;
   jfrm.add(subButton,c);
   c.gridy =4;
```

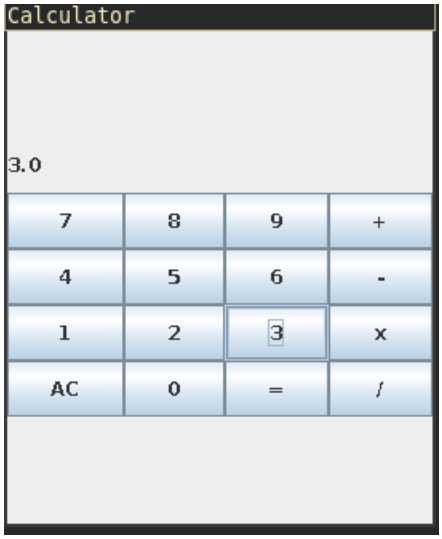
```
jfrm.add(mulButton,c);
c.gridy = 5;
jfrm.add(divButton,c);

JButton equalButton = new JButton("=");
equalButton.addActionListener(new ActionListener()
      {
          public void actionPerformed(ActionEvent ae)
          {
             double result = 0.0;
             String val = disp.getText();
             if(!done)
             {
                if(val.equals("ERROR"))
                {
                   disp.setText("0.0");
                   calc = 0.0;
                }
                else
                {
                   if(add||sub||div||mul)
                   {
                      double operand= Double.parseDouble(val);
                      if(add)
                      {
                         result = calc+operand;
                         add = false;
                      }
                      else if(sub)
                      {
                         result = calc-operand;
                         sub = false;
                      }
                      else if(mul)
                      {
                         result = calc*operand;
                         mul = false;
                      }
                      else if(div)
                      {
                         if(operand!=0.0)
                            result = calc/operand;
                         else{
                            disp.setText("ERROR");
                            done = true;
                            return;
                            }
                         div = false;
                      }
```

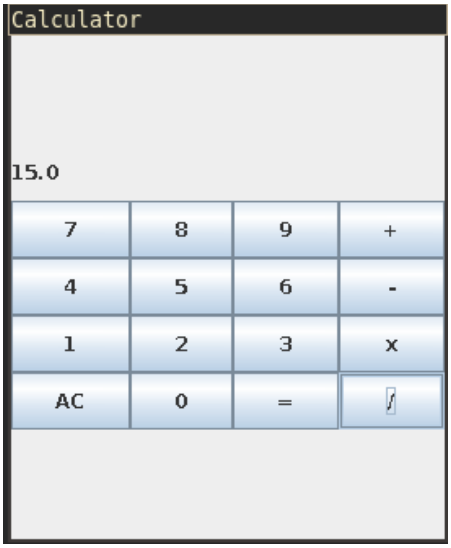
```
                        calc = result;
                        disp.setText(String.valueOf(calc));
                    }
                    else
                    {
                        calc = Double.parseDouble(val);
                    }

                }
                done = true;
            }
        }
    });

    c.gridy=5;
    c.gridx =2;
    jfrm.add(equalButton,c);

    c.gridx = 0;
    JButton clearAll = new JButton("AC");
    clearAll.addActionListener(new ActionListener()
        {
            public void actionPerformed(ActionEvent ae)
            {
                add = mul = div = sub = false;
                done = true;
                disp.setText("0.0");
            }
        }
        );
    jfrm.add(clearAll,c);

  }


  public static void main(String[] args)
  {
    SwingUtilities.invokeLater(new Runnable()
        {
            public void run()
            {
                new Calculator();
            }
        });
  }
}
```

Sample output

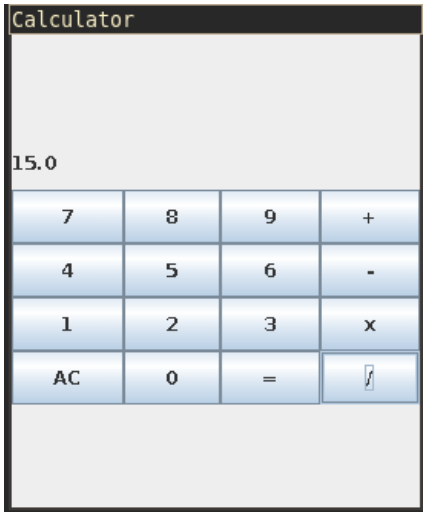
12+3 =15

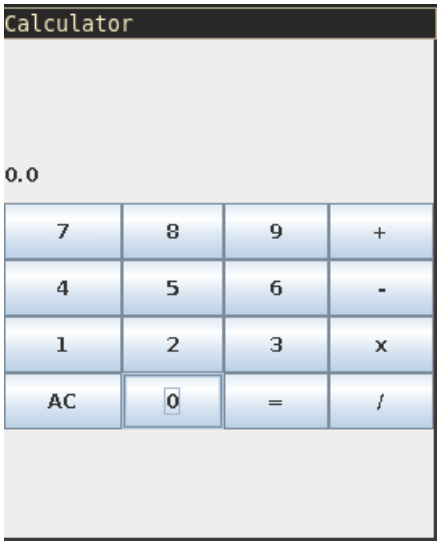


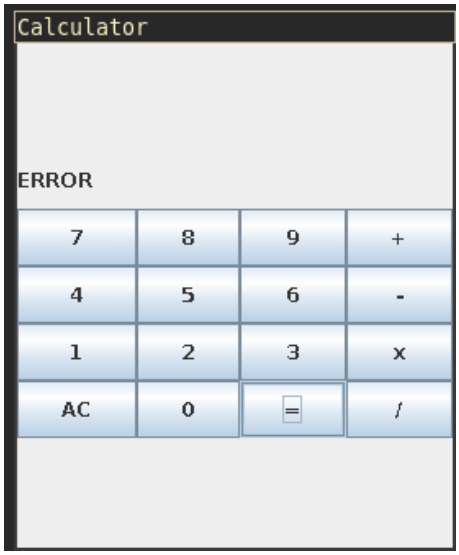




15 / 0 = ERROR







2) Write a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green. When a radio button is selected, the light is turned on, and only one light can be on at a time. No light is on when the program starts.

Program Code

```
/************************************
 * Java Program that simulates a traffic light
 * Done By Rohit Karunakaran
 ************************************/

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

class Signal extends JComponent
{
   private boolean red;
   private boolean yellow;
   private boolean green;
      Signal()
      {
         red = false;
         green =  false;
         yellow = false;
      }

      public void paint(Graphics g)
      {

         Graphics2D g2 = (Graphics2D)g;
         g2.setColor(Color.BLACK);
         g2.drawRect(10,10,200,620);
         g2.fillRect(10,10,200,620);

         if(red)
            g2.setColor(Color.RED);
         else
            g2.setColor(Color.GRAY);  //Red
         g2.drawOval(20,20,180,200);
         g2.fillOval(20,20,180,200);

         if(yellow)
            g2.setColor(Color.YELLOW);
         else
            g2.setColor(Color.GRAY);  //Yellow
         g2.drawOval(20,220,180,200);
         g2.fillOval(20,220,180,200);
```

```
            if(green)
               g2.setColor(Color.GREEN);
            else
               g2.setColor(Color.GRAY);   //Green
            g2.drawOval(20,420,180,200);
            g2.fillOval(20,420,180,200);
         }
         public void toggleRed()
         {
            red = true;
            yellow= false;
            green = false;
         }
         public void toggleGreen()
         {
            red = false;
            yellow= false;
            green = true;
         }
         public void toggleYellow()
         {
            red = false;
            yellow= true;
            green = false;
         }

}

public class TrafficLight
{
   //Bulb greenBulb;
   Bulb yellowBulb;
   Bulb redBulb;

   TrafficLight()
   {
      Signal s = new Signal();
      JFrame jfrm = new JFrame("Traffic Lights");
      jfrm.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
      jfrm.setBounds(50,50,500,720);
      jfrm.setSize(500,720);

      JRadioButton redButton = new JRadioButton("Red");
      redButton.setBounds(240,240,120,30);
      redButton.addActionListener(new ActionListener()
            {
               public void actionPerformed(ActionEvent ae)
               {
```

```
            if(redButton.isSelected())
            {
               s.toggleRed();
               s.repaint();
            }
         }
      }
      );
jfrm.add(redButton);

JRadioButton yellowButton = new JRadioButton("Yellow");
yellowButton.setBounds(240,280,120,30);
yellowButton.addActionListener(new ActionListener()
      {
         public void actionPerformed(ActionEvent ae)
         {
            if(yellowButton.isSelected())
            {
               s.toggleYellow();
               s.repaint();
            }
         }
      }
      );
jfrm.add(yellowButton);

JRadioButton greenButton = new JRadioButton("Green");
greenButton.setBounds(240,320,120,30);
greenButton.addActionListener(new ActionListener()
      {
         public void actionPerformed(ActionEvent ae)
         {
            if(greenButton.isSelected())
            {
               s.toggleGreen();
               s.repaint();
            }
         }
      }
      );
jfrm.add(greenButton);
s.setBounds(10,10,220,640);
jfrm.add(s);

ButtonGroup bg = new ButtonGroup();
bg.add(greenButton);
bg.add(redButton);
bg.add(yellowButton);
```

```
        jfrm.setVisible(true);
        //jfrm.repaint();
    }
    public static void main(String args[])
    {
        new TrafficLight();
    }
}
```

Sample output