Code

```java
import java.awt.*;
import java.awt.event.*;
/*********************************************/

public class MyCalculator extends Frame
{

public boolean setClear=true;
double number, memValue;
char op;

String digitButtonText[] = {"7", "8", "9", "4", "5", "6", "1", "2", "3", "0",
"+/-", "." };
String operatorButtonText[] = {"/", "^", "*", "cos", "-", "sin", "+", "="
,"log"};
String memoryButtonText[] = {"MC", "MR", "MS", "M+" };
String specialButtonText[] = {"Backspc", "C", "CE" };

MyDigitButton digitButton[]=new MyDigitButton[digitButtonText.length];
MyOperatorButton operatorButton[]=new
MyOperatorButton[operatorButtonText.length];
MyMemoryButton memoryButton[]=new MyMemoryButton[memoryButtonText.length];
MySpecialButton specialButton[]=new MySpecialButton[specialButtonText.length];

Label displayLabel=new Label("0",Label.RIGHT);
Label memLabel=new Label(" ",Label.RIGHT);

final int FRAME_WIDTH=325,FRAME_HEIGHT=325;
final int HEIGHT=30, WIDTH=30, H_SPACE=10,V_SPACE=10;
final int TOPX=30, TOPY=50;
///////////////////////////
MyCalculator(String frameText)//constructor
{
super(frameText);

int tempX=TOPX, y=TOPY;
displayLabel.setBounds(tempX,y,240,HEIGHT);
displayLabel.setBackground(Color.BLACK);
displayLabel.setForeground(Color.WHITE);
add(displayLabel);
```

```
memLabel.setBounds(TOPX,  TOPY+HEIGHT+ V_SPACE,WIDTH, HEIGHT);
add(memLabel);

// set Co-ordinates for Memory Buttons
tempX=TOPX;
y=TOPY+2*(HEIGHT+V_SPACE);
for(int i=0; i<memoryButton.length; i++)
{
memoryButton[i]=new MyMemoryButton(tempX,y,WIDTH,HEIGHT,memoryButtonText[i],
this);
memoryButton[i].setForeground(Color.RED);
y+=HEIGHT+V_SPACE;
}

//set Co-ordinates for Special Buttons
tempX=TOPX+1*(WIDTH+H_SPACE); y=TOPY+1*(HEIGHT+V_SPACE);
for(int i=0;i<specialButton.length;i++)
{
specialButton[i]=new MySpecialButton(tempX,y,WIDTH*2,HEIGHT,specialButtonText[i],
this);
specialButton[i].setForeground(Color.RED);
tempX=tempX+2*WIDTH+H_SPACE;
}

//set Co-ordinates for Digit Buttons
int digitX=TOPX+WIDTH+H_SPACE;
int digitY=TOPY+2*(HEIGHT+V_SPACE);
tempX=digitX;  y=digitY;
for(int i=0;i<digitButton.length;i++)
{
digitButton[i]=new MyDigitButton(tempX,y,WIDTH,HEIGHT,digitButtonText[i],
this);
digitButton[i].setForeground(Color.BLUE);
tempX+=WIDTH+H_SPACE;
if((i+1)%3==0){tempX=digitX; y+=HEIGHT+V_SPACE;}
}

//set Co-ordinates for Operator Buttons
int opsX=digitX+2*(WIDTH+H_SPACE)+H_SPACE;
int opsY=digitY;
tempX=opsX;  y=opsY;
for(int i=0;i<operatorButton.length;i++)
{
tempX+=WIDTH+H_SPACE;
operatorButton[i]=new
MyOperatorButton(tempX,y,WIDTH,HEIGHT,operatorButtonText[i], this);
operatorButton[i].setForeground(Color.RED);
if((i+1)%2==0){tempX=opsX; y+=HEIGHT+V_SPACE;}
}

addWindowListener(new WindowAdapter()
{
public void windowClosing(WindowEvent ev)
{System.exit(0);}
});

setLayout(null);
setSize(FRAME_WIDTH,FRAME_HEIGHT);
setVisible(true);
}
//////////////////////////////////
static String getFormattedText(double temp)
{
String resText=""+temp;
if(resText.lastIndexOf(".0")>0)
    resText=resText.substring(0,resText.length()-2);
return resText;
}
////////////////////////////////////////
public static void main(String []args)
{
new MyCalculator("Calculator");
}
}

/*******************************************/

class MyDigitButton extends Button implements ActionListener
{
MyCalculator cl;

//////////////////////////////////////////
MyDigitButton(int x,int y, int width,int height,String cap, MyCalculator clc)
{
super(cap);
setBounds(x,y,width,height);
this.cl=clc;
this.cl.add(this);
addActionListener(this);
```

```
}
////////////////////////////////////////////////
static boolean isInString(String s, char ch)
{
for(int i=0; i<s.length();i++) if(s.charAt(i)==ch) return true;
return false;
}
/////////////////////////////////////////////////
public void actionPerformed(ActionEvent ev)
{
String tempText=((MyDigitButton)ev.getSource()).getLabel();

if(tempText.equals("."))
{
 if(cl.setClear)
    {cl.displayLabel.setText("0.");cl.setClear=false;}
 else if(!isInString(cl.displayLabel.getText(),'.'))
    cl.displayLabel.setText(cl.displayLabel.getText()+".");
 return;
}

int index=0;
try{
        index=Integer.parseInt(tempText);
    }catch(NumberFormatException e){return;}

if (index==0 && cl.displayLabel.getText().equals("0")) return;

if(cl.setClear)
            {cl.displayLabel.setText(""+index);cl.setClear=false;}
else
    cl.displayLabel.setText(cl.displayLabel.getText()+index);
}//actionPerformed
}//class defination

/********************************************/

class MyOperatorButton extends Button implements ActionListener
{
MyCalculator cl;

MyOperatorButton(int x,int y, int width,int height,String cap, MyCalculator
clc)
{
super(cap);
```

```
setBounds(x,y,width,height);
this.cl=clc;
this.cl.add(this);
addActionListener(this);
}
///////////////////////
public void actionPerformed(ActionEvent ev)
{
String opText=((MyOperatorButton)ev.getSource()).getLabel();

cl.setClear=true;
double temp=Double.parseDouble(cl.displayLabel.getText());

if(opText.equals("sin"))
    {
    try
        {double tempd=Math.sin(temp);
        cl.displayLabel.setText(MyCalculator.getFormattedText(tempd));}
    catch(ArithmeticException excp)
                        {cl.displayLabel.setText("Divide by 0.");}
    return;
    }
    if(opText.equals("cos"))
    {
    try
        {double tempd=Math.cos(temp);
        cl.displayLabel.setText(MyCalculator.getFormattedText(tempd));}
    catch(ArithmeticException excp)
                        {cl.displayLabel.setText("Divide by 0.");}
    return;
    }

    if(opText.equals("log"))
    {
    try
        {double tempd=Math.log10(temp);
        cl.displayLabel.setText(MyCalculator.getFormattedText(tempd));}
    catch(ArithmeticException excp)
                        {cl.displayLabel.setText("Divide by 0.");}
    return;
    }


if(!opText.equals("="))
    {
```

```
    cl.number=temp;
    cl.op=opText.charAt(0);
    return;
    }



// process = button pressed
switch(cl.op)
{
case '+':
    temp+=cl.number;break;
case '-':
    temp=cl.number-temp;break;
case '*':
    temp*=cl.number;break;

case '^':
      temp = Math.pow(cl.number, temp);
      break;
case '/':
    try{temp=cl.number/temp;}
        catch(ArithmeticException excp)
                {cl.displayLabel.setText("Divide by 0."); return;}
    break;
}//switch

cl.displayLabel.setText(MyCalculator.getFormattedText(temp));
//cl.number=temp;
}//actionPerformed
}//class

/****************************************/

class MyMemoryButton extends Button implements ActionListener
{
MyCalculator cl;

/////////////////////////////////
MyMemoryButton(int x,int y, int width,int height,String cap, MyCalculator clc)
{
super(cap);
setBounds(x,y,width,height);
this.cl=clc;
this.cl.add(this);
```

```
addActionListener(this);
}
////////////////////////////////////////////////
public void actionPerformed(ActionEvent ev)
{
char memop=((MyMemoryButton)ev.getSource()).getLabel().charAt(1);

cl.setClear=true;
double temp=Double.parseDouble(cl.displayLabel.getText());

switch(memop)
{
case 'C':
    cl.memLabel.setText(" ");cl.memValue=0.0;break;
case 'R':
    cl.displayLabel.setText(MyCalculator.getFormattedText(cl.memValue));break;
case 'S':
    cl.memValue=0.0;
case '+':
    cl.memValue+=Double.parseDouble(cl.displayLabel.getText());
    if(cl.displayLabel.getText().equals("0") ||
cl.displayLabel.getText().equals("0.0")  )
        cl.memLabel.setText(" ");
    else
        cl.memLabel.setText("M");
    break;
}//switch
}//actionPerformed
}//class

/*****************************************/

class MySpecialButton extends Button implements ActionListener
{
MyCalculator cl;

MySpecialButton(int x,int y, int width,int height,String cap, MyCalculator clc)
{
super(cap);
setBounds(x,y,width,height);
this.cl=clc;
this.cl.add(this);
addActionListener(this);
}
//////////////////////
```

```
static String backSpace(String s)
{
String Res="";
for(int i=0; i<s.length()-1; i++) Res+=s.charAt(i);
return Res;
}

//////////////////////////////////////////////////////////
public void actionPerformed(ActionEvent ev)
{
String opText=((MySpecialButton)ev.getSource()).getLabel();
//check for backspace button
if(opText.equals("Backspc"))
{
String tempText=backSpace(cl.displayLabel.getText());
if(tempText.equals(""))
    cl.displayLabel.setText("0");
else
    cl.displayLabel.setText(tempText);
return;
}
//check for "C" button i.e. Reset
if(opText.equals("C"))
{
cl.number=0.0; cl.op=' '; cl.memValue=0.0;
cl.memLabel.setText(" ");
}

//it must be CE button pressed
cl.displayLabel.setText("0");cl.setClear=true;
}//actionPerformed
}//class
```

Pseudo Code

Step 1.

Create a four class namely
MyCalculator,MyDigitButton,MyOperatorButton,MymemoryButton,MySpecialButton

Step 2. From Main Method call MyCalculator Constructor.

Step 3: MyCalculator Class

3.1 Define a string variable for digitbutton ,operator button ,memory button and special button constructor will initiliaze the calculator with its hight and width

3.2 set the co-ordinates for memory button using following formula

y=top+2*(HEIGHT+V_SPACE)

3.3 set the co-ordinates for Special Button using following formula

tempx=top+1*(WIDTH+H_SPACE); y=TOPY + 1*(HEIGHT + V_SPACE)

3.4 set the co-ordinates for Digit Button using Following Formula

digitx=topx+width+H_space ; digity=top+2*(Height+V_Space)

3.5. Set Co-ordinates for Operator Button

opsx=digitx*2(width+h_space)+h_space

Step 4 : My OperatorButton Class

4.1 operator button consist of eight operation viz. sin,cos,log,+,-,*,^,/

4.2 check which operator button is pressed process according to that.Use Built in Function for sin,cos,and log

Step 5 : My Memory Button Class

5.1 Memory Button consist of four button MC,MR,MS,M+

5.2 check which memory button is pressed and do accordingly

If MC is pressed then clear the content like that

Step 6 My Special BUtton Class

6.1 special button consist of three button Backspace,C,CE

6.2 if backspace is pressed then remove one character from last and display

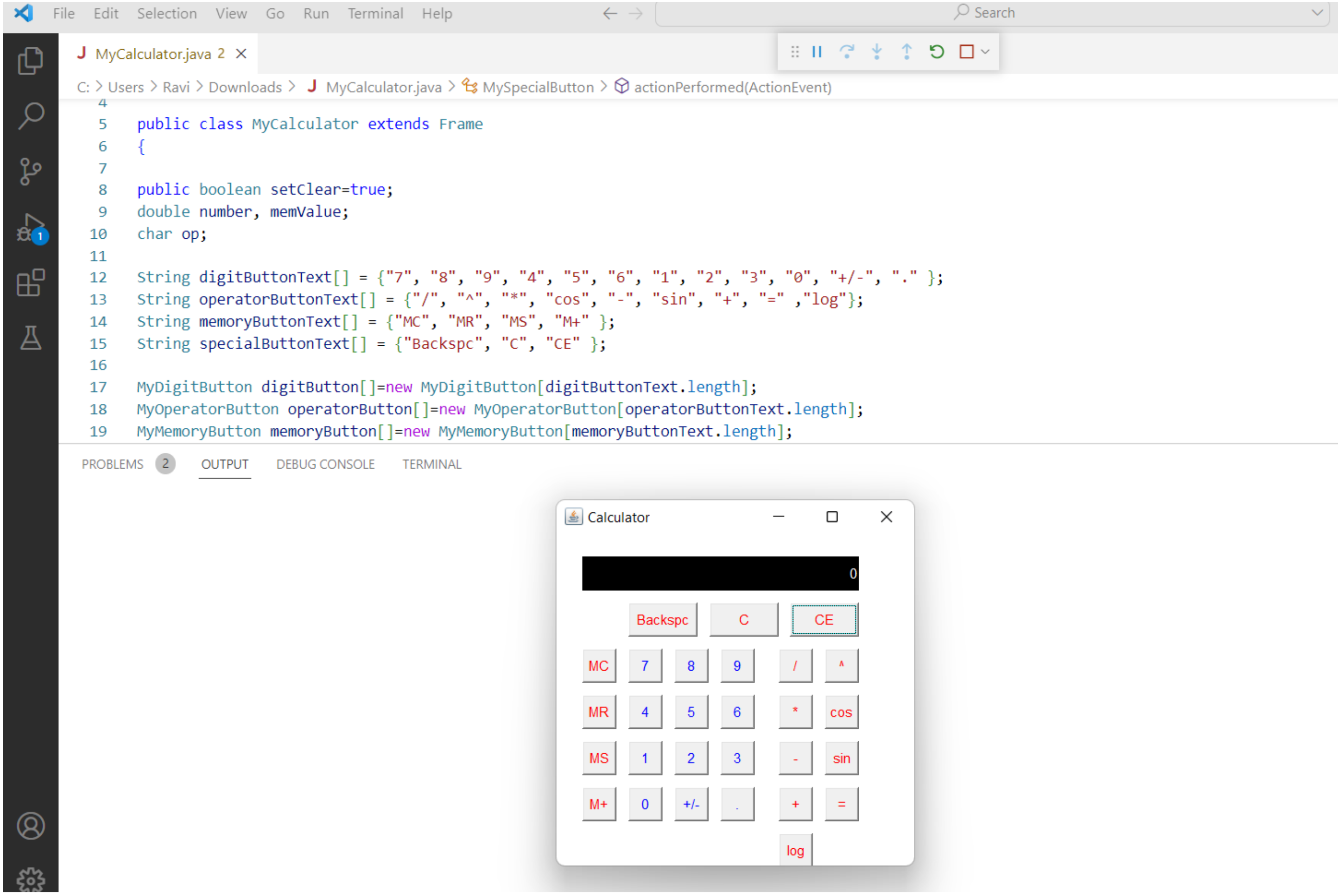
6.3 if C button is pressed then reset the content

Step 7 MY digit Button class

Identify which button is pressed if . is pressed then append 0 before . otherwise append another button value .

Step 8 End

Outputs



```java
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{

public boolean setClear=true;
double number, memValue;
char op;

String digitButtonText[] = {"7", "8", "9", "4", "5", "6", "1", "2", "3", "0", "+/-", "." };
String operatorButtonText[] = {"/", "^", "*", "cos", "-", "sin", "+", "=" ,"log"};
String memoryButtonText[] = {"MC", "MR", "MS", "M+" };
String specialButtonText[] = {"Backspc", "C", "CE" };

MyDigitButton digitButton[]=new MyDigitButton[digitButtonText.length];
MyOperatorButton operatorButton[]=new MyOperatorButton[operatorButtonText.length];
MyMemoryButton memoryButton[]=new MyMemoryButton[memoryButtonText.length];
```

Figure 1 Output Screen of result GUI

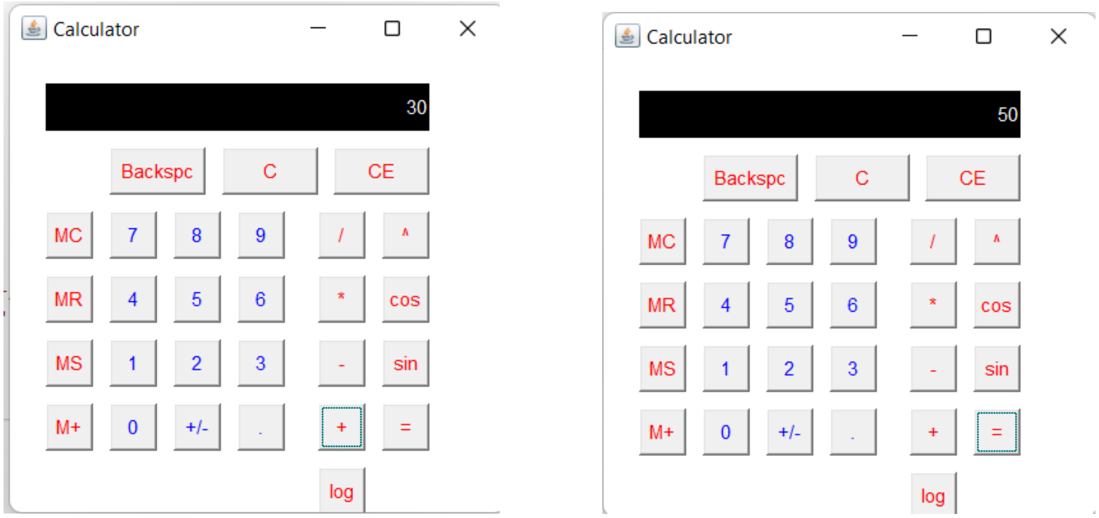


Figure 2 Output Screen of Addition (30+20)

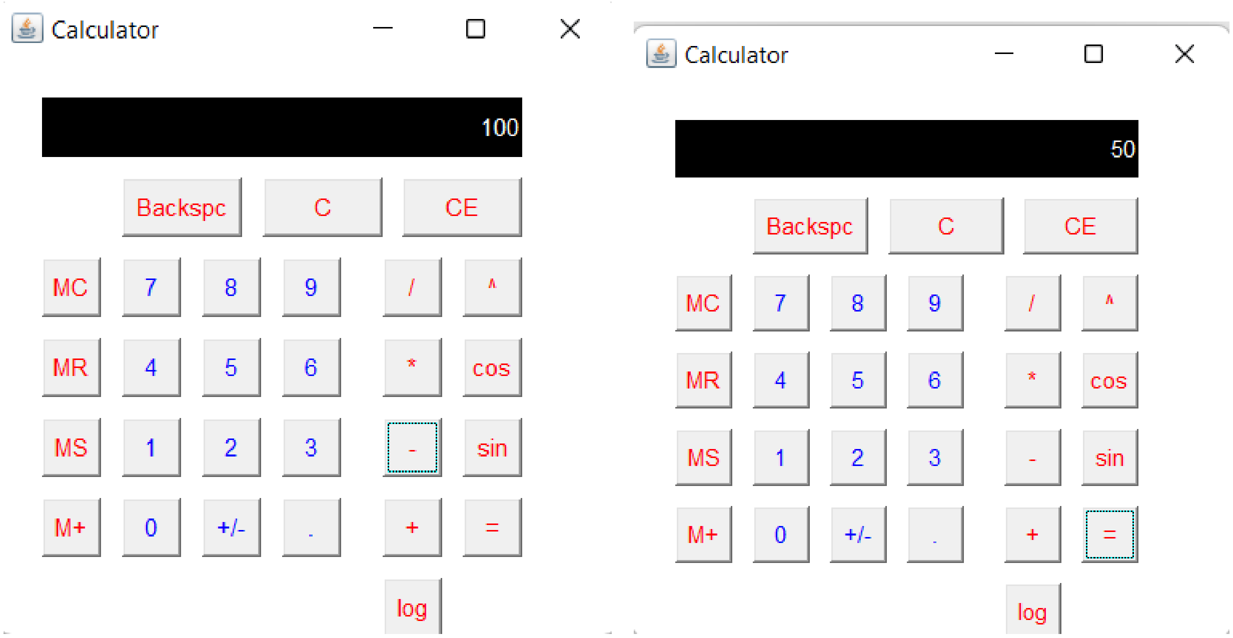


Figure 3 Output Screen of Subtraction (100-50)

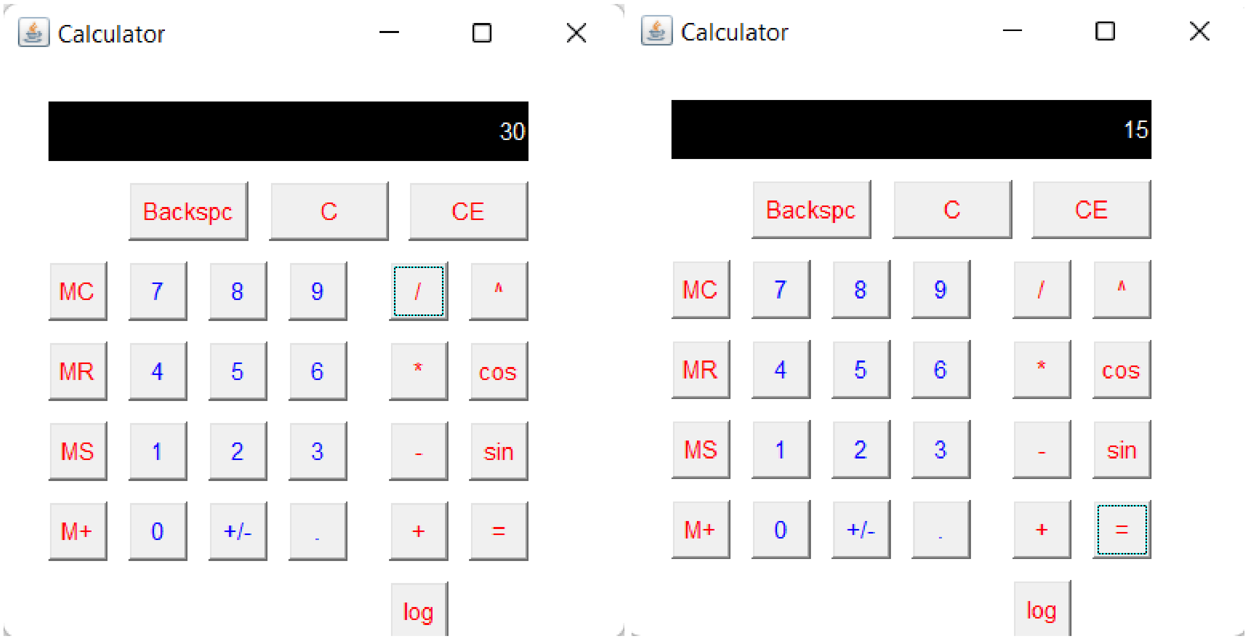


Figure 4 Output Screen of Division (30/2)

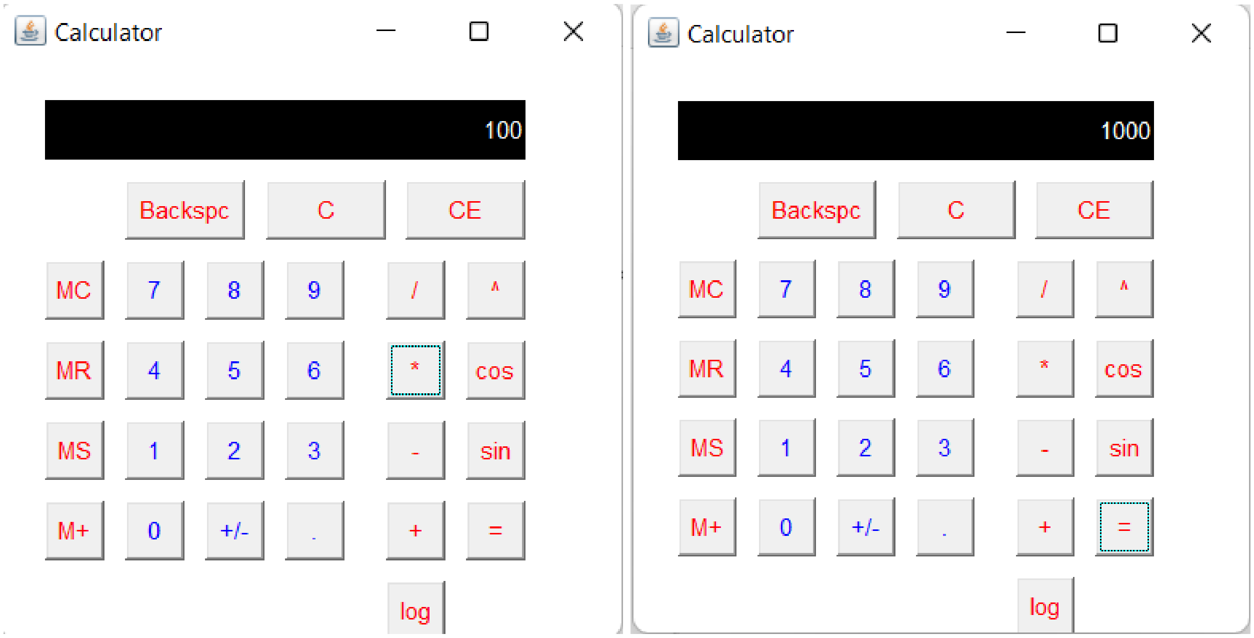
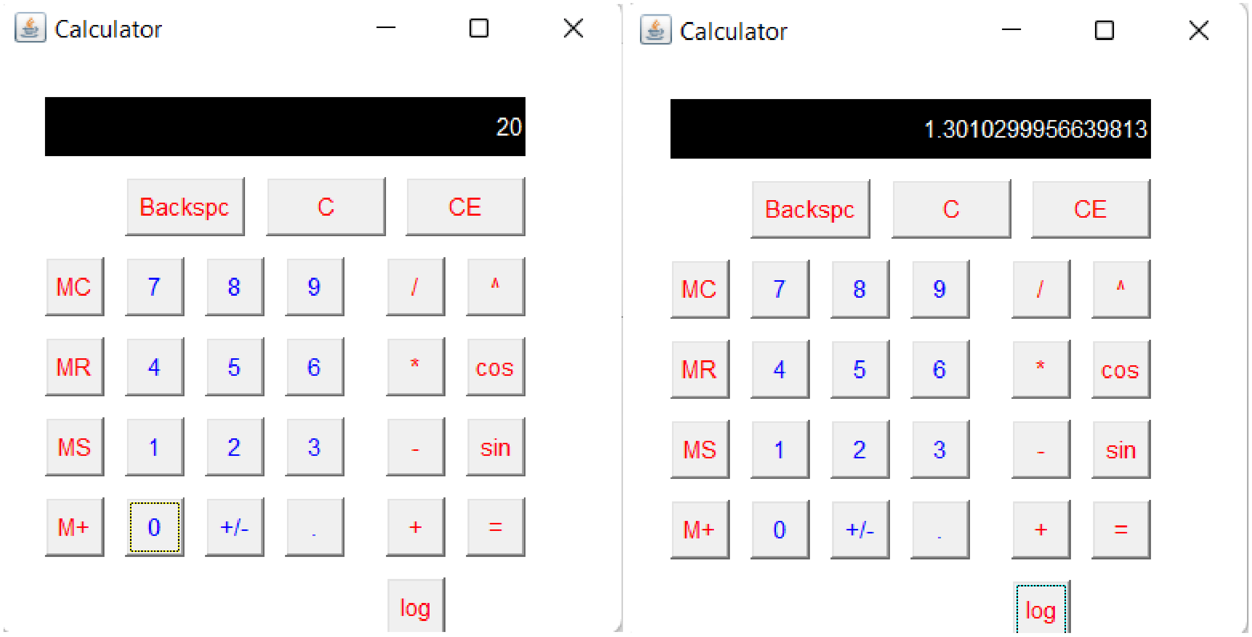


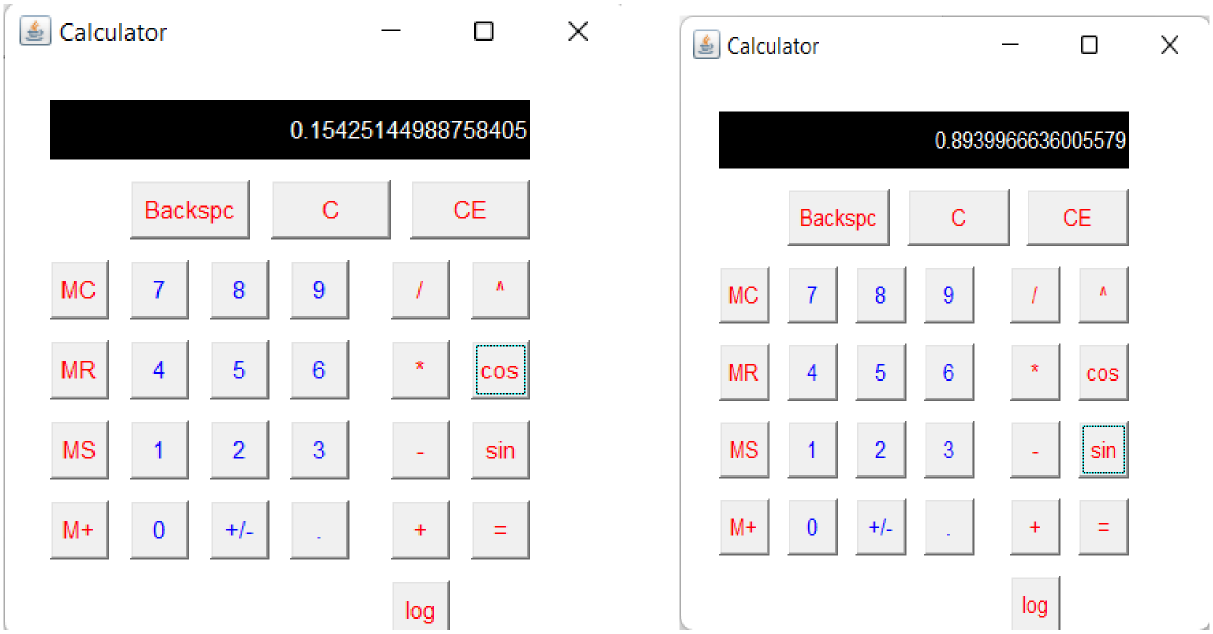
*Figure 5 Output Screen of Multiplication (100 * 10)*



20

1.3010299956639813

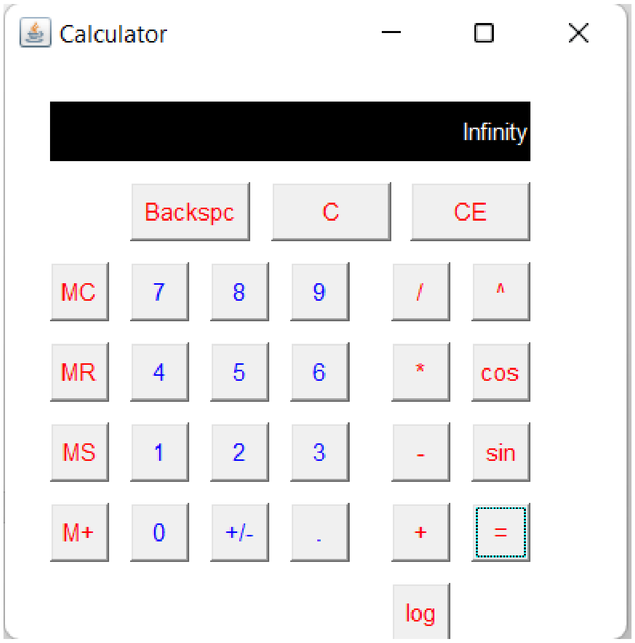
Figure 6 Output Screen of Logarithm (Log 20)



0.15425144988758405

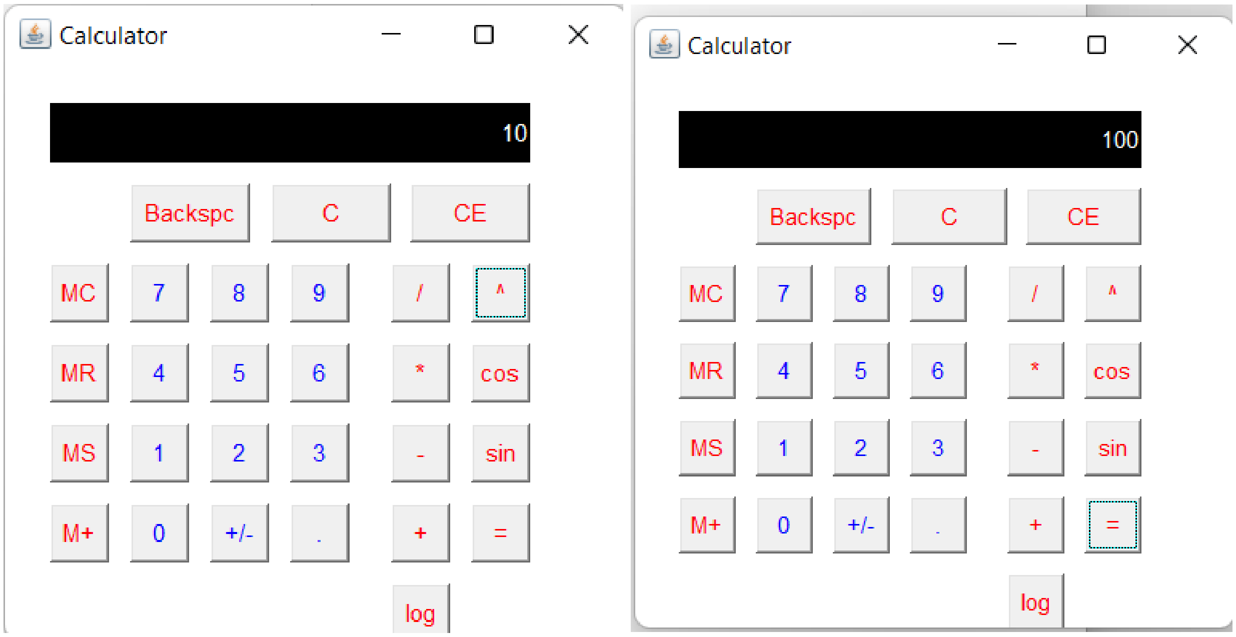
0.8939966636005579

Figure 7 Output Screen of Cosine and Sine Functions



Infinity

Figure 8 Output Screen of Exception (1 / 0)



10

100

Figure 9 Output Screen of Power Function   (10 ^ 2)