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Remote Method Invocation

Exercise:

1. Design a Graphical User Interface (GUI) based calculator. (scientific or standard). Operations should be performed using both mouse and keyboard. Calculator.java package mypackage;

```
import java.rmi.Remote; import
java.rmi.RemoteException;

public interface Calculator extends Remote{ public void
        calculate() throws RemoteException;

}
```

Main.java package

```
mypackage;

import java.rmi.RemoteException; import
java.rmi.server.UnicastRemoteObject; public class Main extends
UnicastRemoteObject implements Calculator{

        protected Main() throws RemoteException { super();
        } private static final long serialVersionUID = 1L;

        @Override
        public void calculate() throws RemoteException { new
                calculator();

        }


}
```

calculator.java package

```
mypackage;

import java.awt.event.*;
import java.awt.*; import
javax.swing.*; public
class calculator extends
JFrame implements
ActionListener
{
```

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```
  JButton b10,b11,b12,b13,b14,b15;    JButton
b[]=new JButton[10];
   int i,r,n1,n2;
JTextField res;     char
op;
  public calculator()
 {
    super("calulator");
     setLayout(new BorderLayout());
     JPanel p=new JPanel();
     p.setLayout(new GridLayout(4,4));
     for(int i=0;i<=9;i++)
     {
       b[i]=new JButton(i+"");
p.add(b[i]);
       b[i].addActionListener(this);
     }
     b10=new JButton("+");
p.add(b10);
b10.addActionListener(this);

     b11=new JButton("-");
p.add(b11);
b11.addActionListener(this);

     b12=new JButton("*");
p.add(b12);
b12.addActionListener(this);

     b13=new JButton("/");
p.add(b13);
     b13.addActionListener(this);


     b14=new JButton("=");
p.add(b14);
b14.addActionListener(this);

     b15=new JButton("C");
p.add(b15);
b15.addActionListener(this);

     res=new JTextField(10);
add(p,BorderLayout.CENTER);
```

```
    add(res,BorderLayout.NORTH);
setVisible(true);
    setSize(200,200);
   }
public void actionPerformed(ActionEvent ae)
{
 JButton pb=(JButton)ae.getSource();
          if(pb==b15)
          {
           r=n1=n2=0;
           res.setText("");
          }
          else if(pb==b14)
                    {
                       n2=Integer.parseInt(res.getText());
                     eval();
                     res.setText(""+r);
                    }

                    else
                    {
            boolean opf=false;      if(pb==b10)
                              { op='+';
                              opf=true;
                              }
                       if(pb==b11)
                              { op='-';opf=true;}
                    if(pb==b12)
                              { op='*';opf=true;}
                    if(pb==b13)
                              { op='/';opf=true;}

                     if(opf==false)
                     {
                       for(i=0;i<10;i++)
                      {
                              if(pb==b[i])
                              {
                               String t=res.getText();
                              t+=i;
                               res.setText(t);
                              }
                      }
```

```
                    }
                    else
                    {
                              n1=Integer.parseInt(res.getText());
                             res.setText("");
                    }
                   }
} int
eval()
{
          switch(op)
          {
 case '+':   r=n1+n2;  break;  case '-':
r=n1-n2;  break;  case '*':   r=n1*n2;
break;
           case '/':    r=n1/n2; break;
 } return 0;
}
}
```

Server.java package

```
mypackage;

import java.rmi.Naming; import
java.rmi.registry.LocateRegistry;


public class Server { public static void
          main(String[] args) { try
                    {
                              Calculator cal=new Main();
                               LocateRegistry.createRegistry(1900);
                             Naming.rebind("rmi://localhost:1900/calculator", cal);
                    }
                    catch(Exception ex)
                    {
                              System.out.println(ex); }

          }
}
```

Client.java package

```
mypackage; import
```

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java.rmi.Naming; public

class Client {

```
        public static void main(String[] args) { try
                {
                        Calculator
access=(Calculator)Naming.lookup("rmi://localhost:1900/calculator");
                        access.calculate();
                }
                catch(Exception ex)
                {
                        System.out.println(ex); }

        }
```

}

Output:

2. Retrieve day, time and date function from server to client. This program should display server day, date and time. Dater.java package datetime;

import java.rmi.Remote; import
java.rmi.RemoteException;
import java.sql.Date; import
java.time.LocalDateTime;

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```
public interface Dater extends Remote { public LocalDateTime
        getDate() throws RemoteException;
}
```

Main.java package

datetime; import

java.rmi.RemoteExc

eption; import

java.rmi.server.Unic

astRemoteObject;

```
import java.sql.Date; import
java.time.LocalDate; import
java.time.LocalDateTime;

public class Main extends UnicastRemoteObject implements Dater{
        Main() throws RemoteException
        {
                super();
        }
        @Override
        public LocalDateTime getDate() throws RemoteException { return
                java.time.LocalDateTime.now();
        }


}
```

Server.java package

datetime;

```
import java.rmi.Naming; import
java.rmi.registry.LocateRegistry; public
class Server {

        public static void main(String[] args) { try
                {
                        Dater dt=new Main();
                          LocateRegistry.createRegistry(1900);
                           Naming.rebind("rmi://localhost:1900/datedisplay", dt);
```

```
                }
                catch(Exception ex)
                {
                        System.out.println(ex); }

        }

}
```

Client.java package

datetime; import

java.rmi.Naming; import

java.sql.Date; import

java.time.LocalDateTime;

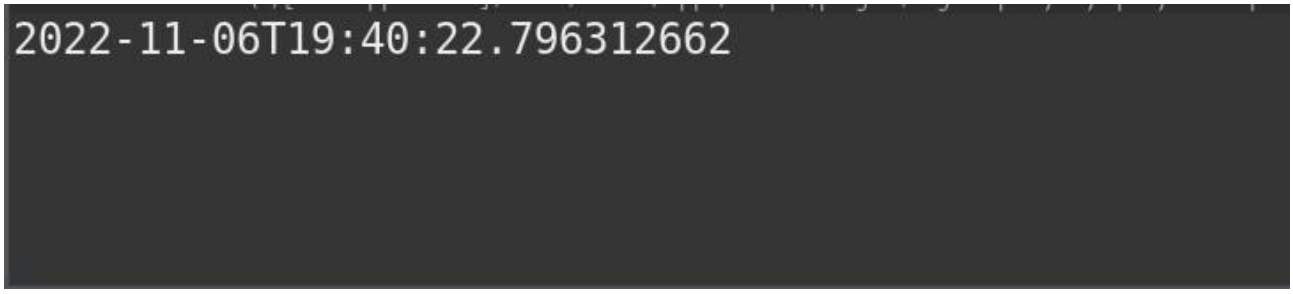
```
public class Client {

        public static void main(String[] args) {
                LocalDateTime answer;
                try
                {
                        Dater
access=(Dater)Naming.lookup("rmi://localhost:1900/datedisplay");
                        answer=access.getDate(); System.out.println(answer);
                }
                catch(Exception ex)
                {
                        System.out.println(ex); }

        }

}
```

Output:



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3. Equation solver. The client should provide an equation to the server through an interface. The server will solve the expression given by the client. (a-b)2 = a2 –2ab + b2;
If a = 5 and b = 2 then return value = 52 – 2*5*2 + 22 = 9.

Equator.java package

```
mypackage;

import java.rmi.Remote; import
java.rmi.RemoteException;

public interface Equator extends Remote{ public int getEquation(int
        a,int b) throws RemoteException;
}
```

Main.java package

```
mypackage;

import java.rmi.RemoteException; import

java.rmi.server.UnicastRemoteObject; public class Main extends

UnicastRemoteObject implements Equator{

        protected Main() throws RemoteException { super();
        } private static final long serialVersionUID = 1L;

        @Override
        public int getEquation(int a, int b) throws RemoteException { int
                result=((a*a)-(2*a*b)+(b*b)); return result;
        }

}
```

Server.java package

```
mypackage;

import java.rmi.Naming; import

java.rmi.registry.LocateRegistry; public

class Server {

        public static void main(String[] args) { try
                {
                        Equator eq=new Main();
```

```
                    LocateRegistry.createRegistry(1900);
                     Naming.rebind("rmi://localhost:1900/equationsolver", eq);
            }
            catch(Exception ex)
            {
                System.out.println(ex); }

        }

}
```

Client.java package

```
mypackage; import

java.rmi.Naming; public

class Client {

        public static void main(String[] args) { try
            {
                Equator
access=(Equator)Naming.lookup("rmi://localhost:1900/equationsolver");
                int answer=access.getEquation(5, 3); System.out.println("(a-b)2=
                "+answer);
            }
            catch(Exception ex)
            {
                System.out.println(ex); }

        }

}
```

Output: