Christian Mesina
Linxuan Liu
CSE 461

Lab 4
Android Distributed Application

1. Simple Remote Calculator

Client Source Code:

MainActivity.java

```
package com.example.calculator;

import android.os.Bundle;
import android.text.TextUtils;
import android.view.View;
import android.widget.Button;
import android.widget.EditText;
import android.widget.TextView;
import java.io.DataInputStream;
import java.io.DataOutputStream;
import java.io.IOException;
import java.net.Socket;
import java.net.UnknownHostException;

import androidx.appcompat.app.AppCompatActivity;

public class MainActivity extends AppCompatActivity implements
View.OnClickListener{
   EditText t1;
   EditText t2;

   Button plus;
   Button minus;
   Button multiply;
   Button divide;

   TextView displayResult;

   String oper = "";

   Socket socket;
   String response = "";

   /** Called when the activity is first created. */
   @Override
```

```
    protected void onCreate (Bundle savedInstanceState){
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);

        // find the EditText elements (defined in
res/layout/activity_main.xml
        t1 = (EditText) findViewById(R.id.t1);
        t2 = (EditText) findViewById(R.id.t2);

        plus = (Button) findViewById(R.id.plus);
        minus = (Button) findViewById(R.id.minus);
        multiply = (Button) findViewById(R.id.multiply);
        divide = (Button) findViewById(R.id.divide);

        displayResult = (TextView) findViewById(R.id.displayResult);

        // set  listeners
        plus.setOnClickListener(this);
        minus.setOnClickListener(this);
        multiply.setOnClickListener(this);
        divide.setOnClickListener(this);
    }

    // @Override
    public void onClick(View view) {
        if (TextUtils.isEmpty(t1.getText().toString())) {
            return;
        }
        switch (view.getId()) {
            case R.id.plus:
                oper = "+";
                break;
            case R.id.minus:
                oper = "-";
                break;
            case R.id.multiply:
                oper = "*";
                break;
            case R.id.divide:
                oper = "/";
                break;
            default:
                break;
        }

        new Thread(new Runnable() {
            @Override
            public void run() {
                try {
                    response = "";
```

```
                    socket = new Socket("192.168.1.9", 6000);
                    DataOutputStream dOut = new
DataOutputStream(socket.getOutputStream());
                    DataInputStream dIn = new
DataInputStream(socket.getInputStream());
                    dOut.writeUTF(t1.getText() + " " + t2.getText() +
" " + oper);
                    dOut.flush();
                    response = dIn.readUTF();
                    runOnUiThread(new Runnable() {
                        @Override
                        public void run() {
                            displayResult.setText(response);
                        }
                    });
                    dIn.close();
                    dOut.close();
                    socket.close();
                }
                catch (UnknownHostException e)
                {
                    e.printStackTrace();
                }
                catch (IOException e)
                {
                    e.printStackTrace();
                }
            }
        }).start();
    }
}
```

AndroidManifest.xml

```
<?xml version="1.0" encoding="utf-8"?>
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
  package="com.example.calculator">
  <uses-permission android:name="android.permission.INTERNET"/>
  <uses-permission
android:name="android.permission.ACCESS_NETWORK_STATE"/>
  <uses-permission
android:name="android.permission.ACCESS_WIFI_STATE"/>
  <uses-permission
android:name="android.permission.CHANGE_WIFI_STATE"/>
  <application
      android:allowBackup="true"
      android:icon="@mipmap/ic_launcher"
      android:label="@string/app_name"
      android:roundIcon="@mipmap/ic_launcher_round"
      android:supportsRtl="true"
      android:theme="@style/AppTheme">
```

```
      <activity android:name=".MainActivity">
          <intent-filter>
              <action android:name="android.intent.action.MAIN" />
              <category
android:name="android.intent.category.LAUNCHER" />
          </intent-filter>
      </activity>
  </application>
</manifest>
<?xml version="1.0" encoding="utf-8"?>
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
  package="com.example.calculator">
  <uses-permission android:name="android.permission.INTERNET"/>
  <uses-permission
android:name="android.permission.ACCESS_NETWORK_STATE"/>
  <uses-permission
android:name="android.permission.ACCESS_WIFI_STATE"/>
  <uses-permission
android:name="android.permission.CHANGE_WIFI_STATE"/>
  <application
      android:allowBackup="true"
      android:icon="@mipmap/ic_launcher"
      android:label="@string/app_name"
      android:roundIcon="@mipmap/ic_launcher_round"
      android:supportsRtl="true"
      android:theme="@style/AppTheme">
      <activity android:name=".MainActivity">
          <intent-filter>
              <action android:name="android.intent.action.MAIN" />
              <category
android:name="android.intent.category.LAUNCHER" />
          </intent-filter>
      </activity>
  </application>
</manifest>
```

activity_main.xml

```
<?xml version="1.0" encoding="utf-8"?>
<LinearLayout
   xmlns:android="http://schemas.android.com/apk/res/android"
   android:orientation="vertical"
   android:layout_width="fill_parent"
   android:layout_height="fill_parent">
   <LinearLayout
       android:layout_width="match_parent"
       android:layout_height="wrap_content"
       android:id="@+id/linearLayout1"
       android:layout_marginLeft="12pt"
       android:layout_marginRight="12pt"
```

```
    android:layout_marginTop="4pt">
    <EditText
        android:layout_weight="1"
        android:layout_height="wrap_content"
        android:layout_marginRight="6pt"
        android:id="@+id/t1"
        android:layout_width="match_parent"
        android:inputType="numberDecimal">
    </EditText>
    <EditText
        android:layout_height="wrap_content"
        android:layout_weight="1"
        android:layout_marginLeft="6pt"
        android:id="@+id/t2"
        android:layout_width="match_parent"
        android:inputType="numberDecimal">
    </EditText>
</LinearLayout>
<LinearLayout
    android:layout_width="match_parent"
    android:layout_height="wrap_content"
    android:id="@+id/linearLayout2"
    android:layout_marginTop="4pt"
    android:layout_marginLeft="6pt"
    android:layout_marginRight="6pt">
    <Button
        android:layout_height="wrap_content"
        android:layout_width="match_parent"
        android:layout_weight="1"
        android:text="+"
        android:textSize="10pt"
        android:id="@+id/plus">
    </Button>
    <Button
        android:layout_height="wrap_content"
        android:layout_width="match_parent"
        android:layout_weight="1"
        android:text="-"
        android:textSize="8pt"
        android:id="@+id/minus">
    </Button>
</LinearLayout>

<LinearLayout
    android:layout_width="match_parent"
    android:layout_height="wrap_content"
    android:id="@+id/linearLayout3"
    android:layout_marginTop="4pt"
    android:layout_marginLeft="6pt"
    android:layout_marginRight="6pt">
```

```
        <Button
            android:layout_height="wrap_content"
            android:layout_width="match_parent"
            android:layout_weight="1"
            android:text="*"
            android:textSize="10pt"
            android:id="@+id/multiply">
        </Button>
        <Button
            android:layout_height="wrap_content"
            android:layout_width="match_parent"
            android:layout_weight="1"
            android:text="/"
            android:textSize="10pt"
            android:id="@+id/divide">
        </Button>
    </LinearLayout>
    <TextView
        android:layout_height="wrap_content"
        android:layout_width="match_parent"
        android:layout_marginLeft="6pt"
        android:layout_marginRight="6pt"
        android:textSize="12pt"
        android:layout_marginTop="4pt"
        android:id="@+id/displayResult"
        android:gravity="center_horizontal">
    </TextView>
</LinearLayout>
```

Server Source Code:

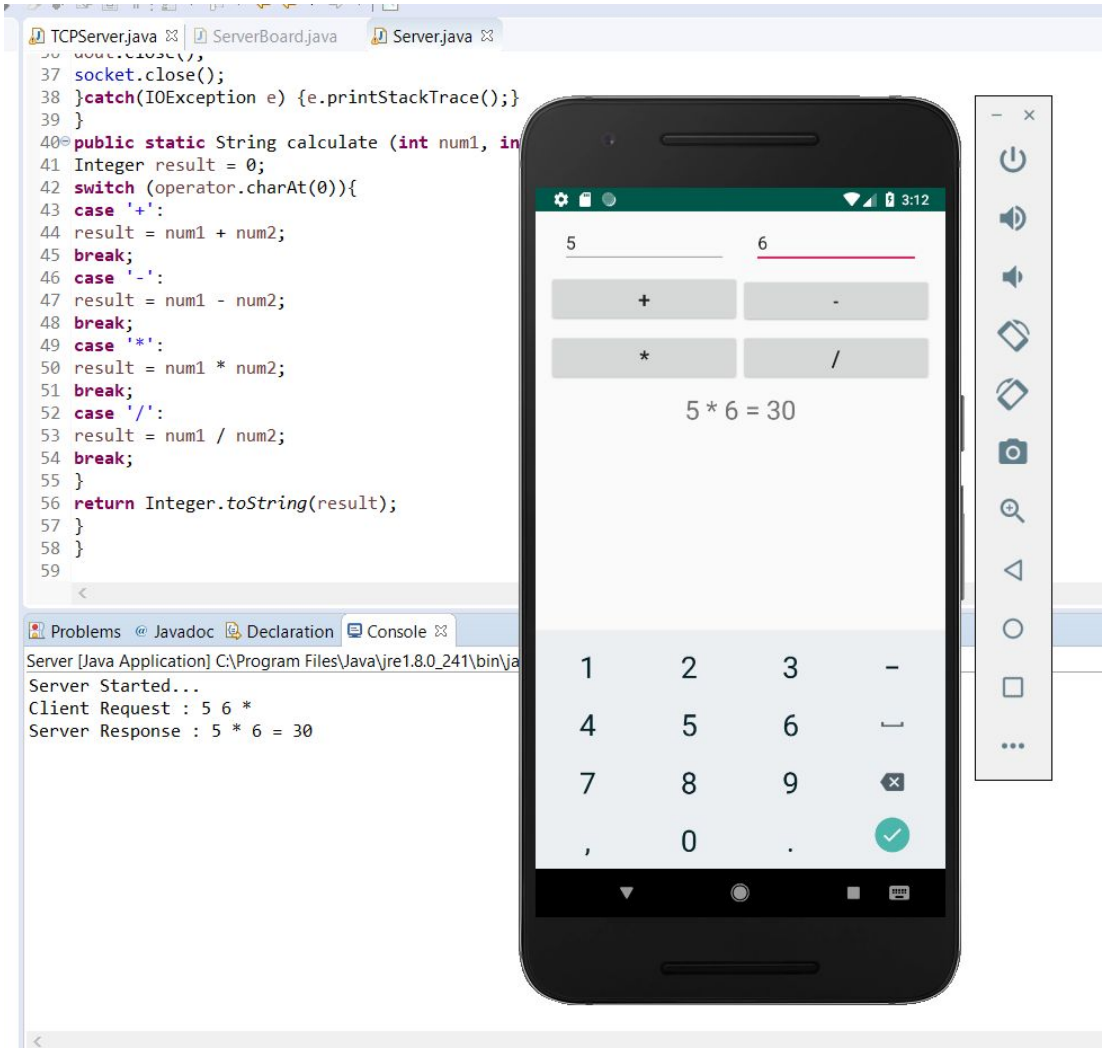
Server.java

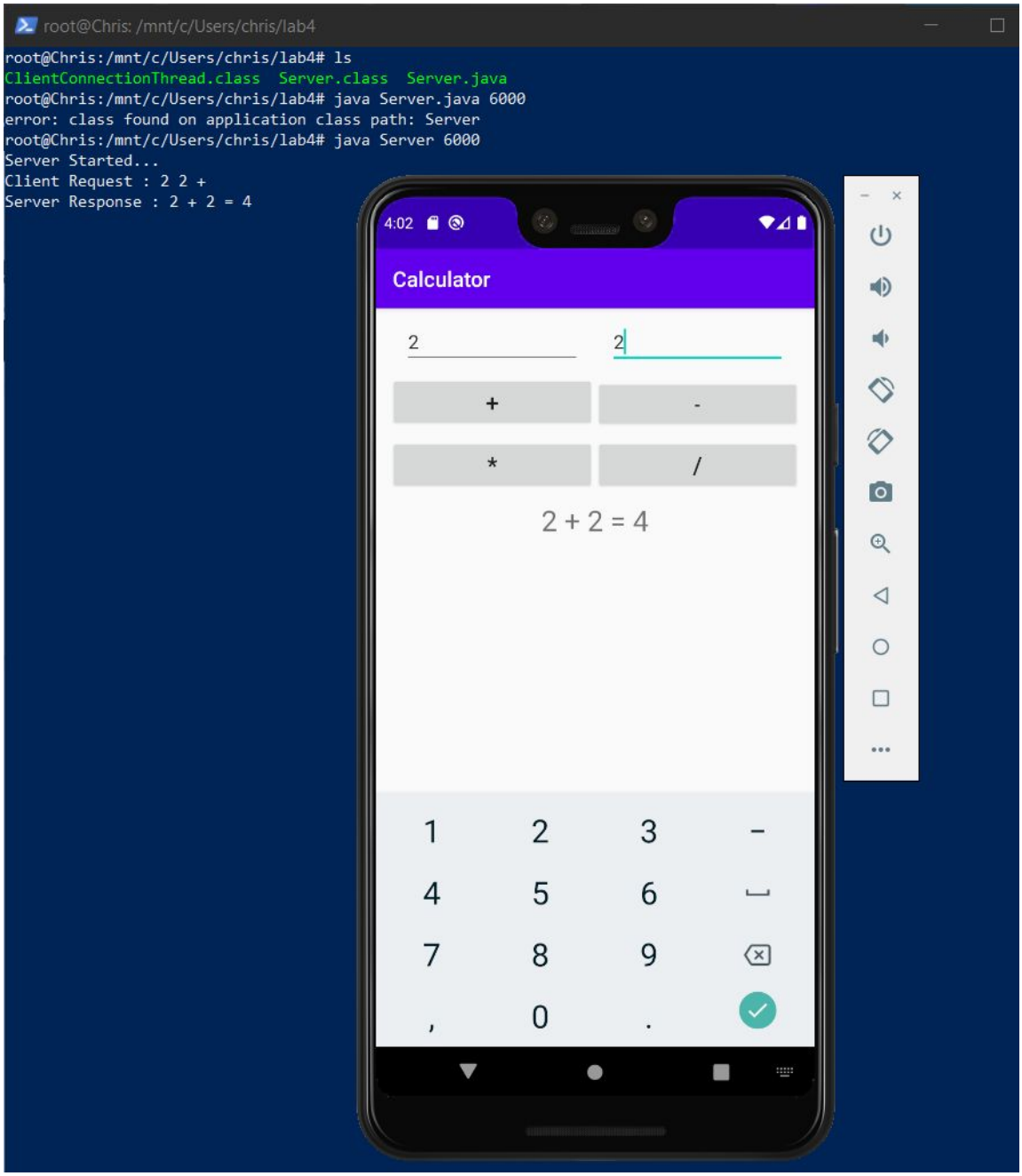
```
import java.io.IOException;
import java.net.ServerSocket;
import java.net.Socket;
import java.util.Scanner;
import java.lang.*;
import java.io.*;

public class Server
{
    public static void main(String[] args)
    {
        try
        {
            ServerSocket serverSocket = new ServerSocket(6000);
            System.out.println("Server Started...");
```

```
            while(true)
            {
                new Thread(new
ClientConnectionThread(serverSocket.accept())).start();
            }
        }
        catch(IOException e) {e.printStackTrace();}
    }
}

class ClientConnectionThread implements Runnable
{
    private Socket socket;

    public ClientConnectionThread(Socket socket)
    {
        this.socket = socket;
    }

    @Override
    public void run()
    {
        try
        {
            DataInputStream dIn = new
DataInputStream(socket.getInputStream());
            DataOutputStream dOut = new
DataOutputStream(socket.getOutputStream());

            String message = dIn.readUTF();
            System.out.println("Client Request : " + message);

            String[] input = message.split(" ");
            String result = input[0] + " " + input[2] + " " +
input[1] + " = " + calculate(Integer.parseInt(input[0]),
Integer.parseInt(input[1]), input[2]);
            System.out.println("Server Response : " + result);

            dOut.writeUTF(result);
            dOut.flush();
            dOut.close();

            socket.close();
        }
        catch(IOException e) {e.printStackTrace();}
    }

    public static String calculate(int num1, int num2, String
operator)
    {
```

```
        Integer result = 0;
        switch (operator.charAt(0))
        {
            case '+':
                result = num1 + num2;
                break;
            case '-':
                result = num1 - num2;
                break;
            case '*':
                result = num1 * num2;
                break;
            case '/':
                result = num1 / num2;
                break;
        }

        return Integer.toString(result);
    }
}
```

Outputs:


TCPServer.java
ServerBoard.java
Server.java
socket.close();
}catch(IOException e) {e.printStackTrace();}
}
public static String calculate (int num1, in
Integer result = 0;
switch (operator.charAt(0)){
case '+':
result = num1 + num2;
break;
case '-':
result = num1 - num2;
break;
case '*':
result = num1 * num2;
break;
case '/':
result = num1 / num2;
break;
}
return Integer.toString(result);
}
}
Problems
Javadoc
Declaration
Console
Server [Java Application] C:\Program Files\Java\jre1.8.0_241\bin\ja
Server Started...
Client Request : 5 6 *
Server Response : 5 * 6 = 30
3:12
5
6
+
-
*
/
5 * 6 = 30
1
2
3
4
5
6
7
8
9
,
0
.


root@Chris: /mnt/c/Users/chris/lab4
root@Chris:/mnt/c/Users/chris/lab4# ls
ClientConnectionThread.class Server.class Server.java
root@Chris:/mnt/c/Users/chris/lab4# java Server.java 6000
error: class found on application class path: Server
root@Chris:/mnt/c/Users/chris/lab4# java Server 6000
Server Started...
Client Request : 2 2 +
Server Response : 2 + 2 = 4
4:02
Calculator
2
2
+
-
*
/
2 + 2 = 4
1
2
3
4
5
6
7
8
9
,
0
.

2. Remote Random Number Generator

Client Source Code:

MainActivity.java

```
package com.example.randomnumber;
import android.app.Activity;
import android.os.Bundle;
import android.view.Gravity;
import android.view.View;
import android.widget.EditText;
import android.widget.TextView;
import java.io.IOException;
import java.net.Socket;
import java.io.*;
import java.net.UnknownHostException;
import java.lang.*;
import android.widget.Button;
public class MainActivity extends Activity implements
View.OnClickListener{
   EditText t1;
   EditText t2;
   EditText t3;
   Button send;
   TextView displayResult;
   Socket socket;
   String response = "";
   @Override
   public void onCreate(Bundle savedInstanceState){
       super.onCreate(savedInstanceState);
       setContentView(R.layout.activity_main);
       t1 = (EditText) findViewById(R.id.t1);
       t2 = (EditText) findViewById(R.id.t2);
       t3 = (EditText) findViewById(R.id.t3);
       send = (Button) findViewById(R.id.send);
       displayResult = (TextView) findViewById(R.id.displayResult);
       send.setOnClickListener( this );
       t1.setGravity(Gravity.CENTER);
       t2.setGravity(Gravity.CENTER);
       t3.setGravity(Gravity.CENTER);
       displayResult.setGravity(Gravity.CENTER);
   }
   public void onClick(View view){
       new Thread(new Runnable() {
           @Override
           public void run() {
               try {
                   response = "";
                   socket = new Socket("192.168.1.24", 5000);
```

```
                    DataOutputStream dOut = new
DataOutputStream(socket.getOutputStream());
                    DataInputStream dIn = new
DataInputStream(socket.getInputStream());
                    dOut.writeUTF (t1.getText() + " "+ t2.getText()+
" "+ t3.getText());
                    dOut.flush();
                    response = dIn.readUTF();
                    runOnUiThread(new Runnable() {
                        @Override
                        public void run() {
                            displayResult.setText(response);
                        }
                    });
                    dIn.close();
                    dOut.close();
                    socket.close();
                }
                catch (UnknownHostException e)
                {
                    e.printStackTrace();
                }
                catch (IOException e)
                {
                    e.printStackTrace();
                }
            }
        }).start();
    }
}
```

AndroidManifest.xml

```
<?xml version="1.0" encoding="utf-8"?>
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
    package="com.example.randomnumber">
    <uses-permission android:name="android.permission.INTERNET"/>
    <uses-permission
android:name="android.permission.ACCESS_NETWORK_STATE"/>
    <uses-permission
android:name="android.permission.ACCESS_WIFI_STATE"/>
    <uses-permission
android:name="android.permission.CHANGE_WIFI_STATE"/>
    <application
        android:allowBackup="true"
        android:icon="@mipmap/ic_launcher"
        android:label="randomnumber"
        android:roundIcon="@mipmap/ic_launcher_round"
```

```
        android:supportsRtl="true"
        android:theme="@style/AppTheme">
        <activity android:name=".MainActivity">
            <intent-filter>
                <action android:name="android.intent.action.MAIN" />
                <category
android:name="android.intent.category.LAUNCHER" />
            </intent-filter>
        </activity>
    </application>
</manifest>
```

activity_main.xml

```
<?xml version="1.0" encoding="utf-8"?>
<LinearLayout
    xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:tools="http://schemas.android.com/tools"
    android:orientation="vertical"
    android:layout_width="fill_parent"
    android:layout_height="fill_parent">
    <TextView
        android:id="@+id/textView2"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_gravity="center"
        android:layout_marginTop="40dp"
        android:gravity="center"
        android:text="Upper Bound:"
        android:textSize="18sp" />
    <EditText
        android:id="@+id/t1"
        android:layout_width="250dp"
        android:layout_height="wrap_content"
        android:layout_gravity="center"
        android:layout_marginLeft="20dp"
        android:layout_marginTop="20dp"
        android:layout_marginRight="20dp"
        android:layout_marginBottom="20dp"
        android:autofillHints=""
        android:gravity="center|start"
        android:inputType="numberDecimal"
        android:textAllCaps="false"
        android:textStyle="normal" />
    <TextView
        android:id="@+id/textView"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
```

```
    android:layout_gravity="center"
    android:gravity="center"
    android:text="Lower Bound:"
    android:textSize="18sp" />
<EditText
    android:id="@+id/t2"
    android:layout_width="250dp"
    android:layout_height="wrap_content"
    android:layout_gravity="center"
    android:layout_marginLeft="20dp"
    android:layout_marginTop="20dp"
    android:layout_marginRight="20dp"
    android:layout_marginBottom="20dp"
    android:autofillHints=""
    android:gravity="center|start"
    android:inputType="numberDecimal" />
<TextView
    android:id="@+id/textView3"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_gravity="center"
    android:gravity="center"
    android:text="Number you want:"
    android:textSize="18sp" />
<EditText
    android:id="@+id/t3"
    android:layout_width="250dp"
    android:layout_height="wrap_content"
    android:layout_gravity="center"
    android:layout_marginLeft="20dp"
    android:layout_marginTop="20dp"
    android:layout_marginRight="20dp"
    android:layout_marginBottom="20dp"
    android:autofillHints=""
    android:gravity="center|start"
    android:inputType="numberDecimal" />
<Button
    android:id="@+id/send"
    android:layout_width="match_parent"
    android:layout_height="wrap_content"
    android:layout_gravity="center"
    android:layout_marginLeft="100dp"
    android:layout_marginRight="100dp"
    android:layout_marginBottom="20dp"
    android:gravity="center"
    android:text="Send" />
<TextView
    android:id="@+id/textView4"
    android:layout_width="match_parent"
    android:layout_height="wrap_content"
```

```
        android:layout_gravity="center"
        android:gravity="center"
        android:text="Result Numbers are:"
        android:textSize="18sp" />
    <TextView
        android:id="@+id/displayResult"
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        android:layout_marginLeft="6pt"
        android:layout_marginTop="4pt"
        android:layout_marginRight="6pt"
        android:gravity="start|center_horizontal"
        android:textSize="12pt"></TextView>
</LinearLayout>
```

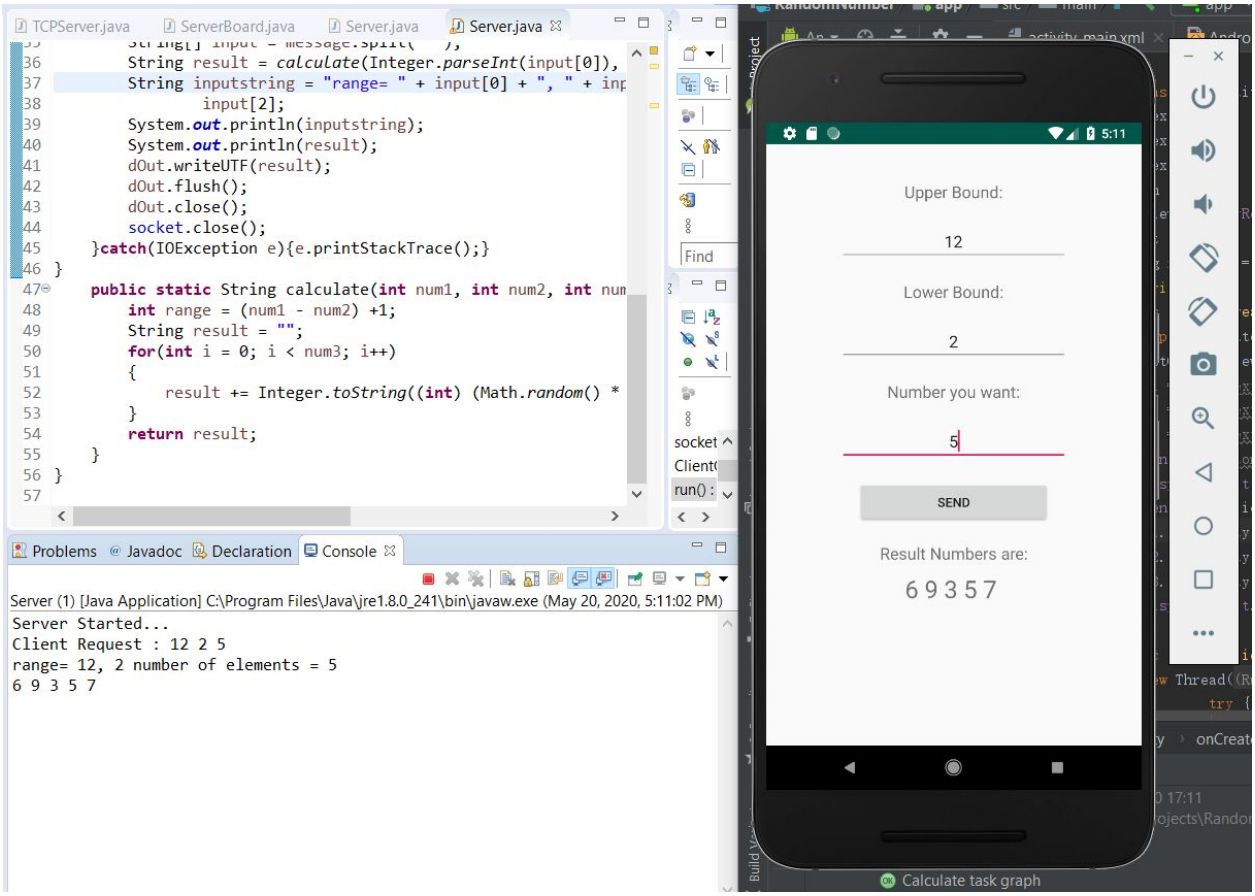
Server Source Code:

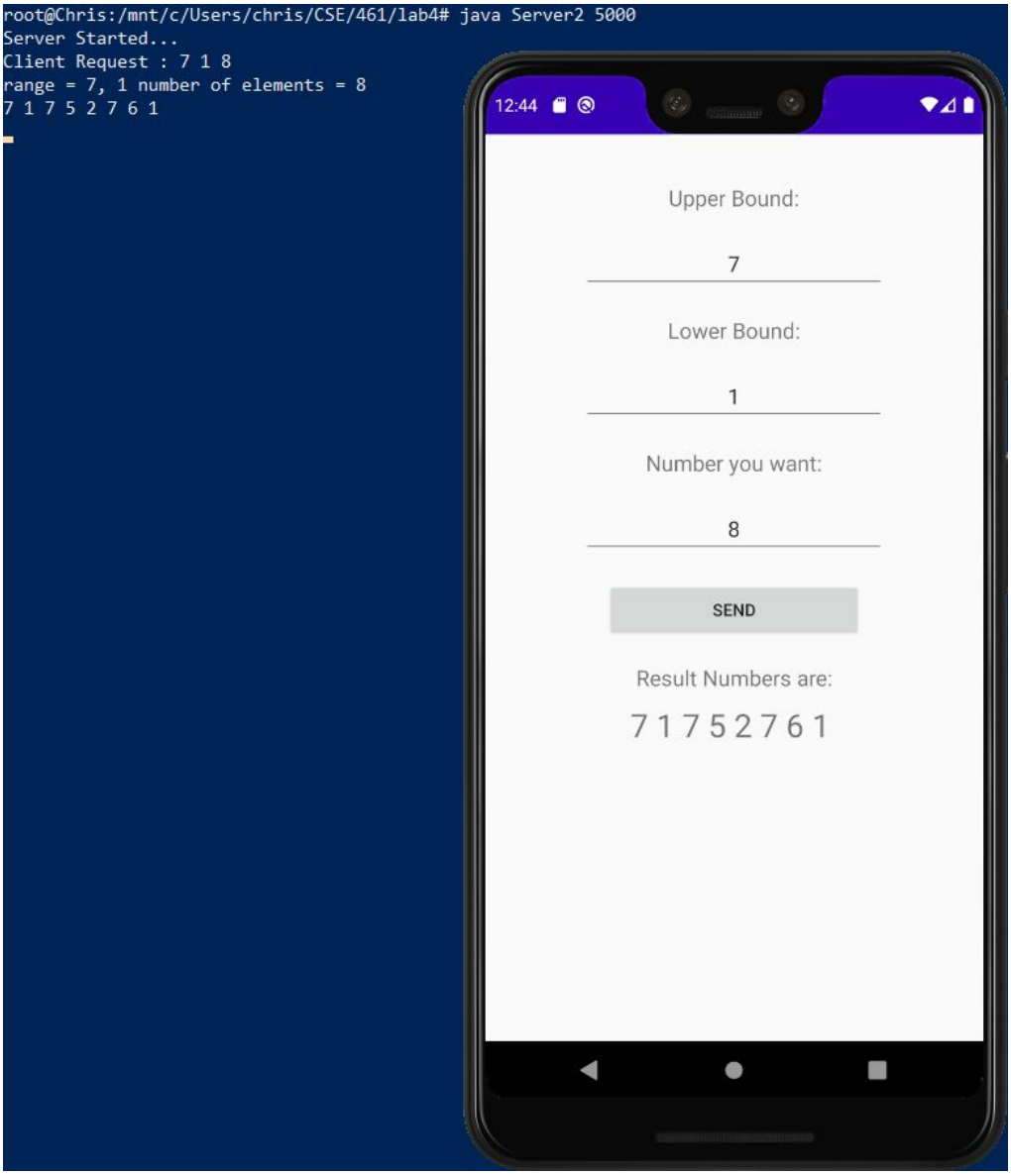
Server.java

```
import java.io.IOException;
import java.net.ServerSocket;
import java.net.Socket;
import java.util.Scanner;
import java.lang.*;
import java.io.*;
import java.util.Random;
import java.util.Arrays;
public class Server{
public static void main(String[] args){
  try{
    ServerSocket serverSocket = new ServerSocket(5000);
    System.out.println("Server Started...");
    while(true){
      new Thread(new
ClientConnectionThread(serverSocket.accept())).start();
    }
  }catch(IOException e) {e.printStackTrace();}
}
}
class ClientConnectionThread implements Runnable{
  private Socket socket;
  public ClientConnectionThread(Socket socket){
    this.socket = socket;
  }

@Override
public void run(){
  try{
```

```
    DataInputStream dIn = new
DataInputStream(socket.getInputStream());
    DataOutputStream dOut = new
DataOutputStream(socket.getOutputStream());
    String message = dIn.readUTF();
    System.out.println("Client Request : " + message);
    String[] input = message.split(" ");
    String result = calculate(Integer.parseInt(input[0]),
Integer.parseInt(input[1]), Integer.parseInt(input[2]));
    String inputstring = "range= " + input[0] + ", " + input[1] + "
number of elements = " +
        input[2];
    System.out.println(inputstring);
    System.out.println(result);
    dOut.writeUTF(result);
    dOut.flush();
    dOut.close();
    socket.close();
  }catch(IOException e){e.printStackTrace();}
}
  public static String calculate(int num1, int num2, int num3) {
    int range = (num1 - num2) +1;
    String result = "";
    for(int i = 0; i < num3; i++)
    {
      result += Integer.toString((int) (Math.random() * range) +
num2) + " ";
    }
    return result;
  }
}
```

Outputs:


TCPServer.java
ServerBoard.java
Server.java
Server.java
String result = calculate(Integer.parseInt(input[0]),
String inputstring = "range= " + input[0] + ", " + inp
input[2];
System.out.println(inputstring);
System.out.println(result);
dOut.writeUTF(result);
dOut.flush();
dOut.close();
socket.close();
}catch(IOException e){e.printStackTrace();}
}
public static String calculate(int num1, int num2, int num
int range = (num1 - num2) +1;
String result = "";
for(int i = 0; i < num3; i++)
{
result += Integer.toString((int) (Math.random() *
}
return result;
}
}
Problems
Javadoc
Declaration
Console
Server (1) [Java Application] C:\Program Files\Java\jre1.8.0_241\bin\javaw.exe (May 20, 2020, 5:11:02 PM)
Server Started...
Client Request : 12 2 5
range= 12, 2 number of elements = 5
6 9 3 5 7
5:11
Upper Bound:
12
Lower Bound:
2
Number you want:
5
SEND
Result Numbers are:
69357
Calculate task graph


root@Chris:/mnt/c/Users/chris/CSE/461/lab4# java Server2 5000
Server Started...
Client Request : 7 1 8
range = 7, 1 number of elements = 8
7 1 7 5 2 7 6 1
12:44
Upper Bound:
7
Lower Bound:
1
Number you want:
8
SEND
Result Numbers are:
7 1 7 5 2 7 6 1

3. Report

- For this lab, one of the concerns/struggles that we had was figuring out how to connect both server and client source codes because we haven't had much experience doing server connections using PuTTy or any other IDE. We managed to figure everything out by going to the links that the professor gave us and searching every material about server connections. For the android studio coding part, it was easier to figure out than the server side because we learned it during the previous lab. The only hard part was figuring out how to implement the socket functions for it to communicate with the server. Overall, we implemented everything correctly based on the instructions on the lab manual. Therefore, we believe that we should get the full points which is **20/20**.