

## Short answers and simple programming tasks

### Chapter 1.

1. Android Virtual Device
2. eXtensible Markup Language
3. <a>hello</> → valid  
</b>Hello<b> → invalid  
<c digit="6"></c> → valid  
<d>He there</e> → invalid  
<f letter='Z' /> → invalid  
<l digit="8">one</l> → valid  
<g digit1="1" digit2="2"></g> → valid  
<h><i name="Chris"></i></h> → valid  
<j><k name="Jane"></j> → invalid  
<l><m name="Mary"></l></m> → invalid
4. abc
5. Hello
6. hi
7. `Android.support.v7.app`
8. True

### Chapter 2.

1. Model View Controller
2. Display data to the user, Let the user interact with the app and Let the user input data
3. `RelativeLayout`
4. `android.view`
5. `baseStyle`
6. `android:textColor`
7. `android:theme`
8. `android:background="@color/myColor"`
9. `android:onClick`
10. `TextWatcher`

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The screenshot displays the Android Studio environment with the following components:

- Emulators:** Two Nexus 5X devices are shown running the application. The left emulator shows a "THANK YOU!" message, and the right emulator shows a "PASSWORD MUST MATCH!" message.
- XML Editor:** The "activity\_main.xml" layout file is open, showing a ConstraintLayout with three EditTexts and one Button. The layout includes constraints for alignment and margins.
- Java Code Editor:** The "MainActivity.java" file is open, containing Java code for the MainActivity class. It includes imports, a class definition, variable declarations, and an onCreate method with an onClick listener for the button.
- Component Tree:** A tree view on the right side of the XML editor shows the hierarchy of views: ConstraintLayout > txt\_check (TextView) > edt\_pass\_fst (EditText) > edt\_pass\_sec (EditText) > btn\_pass\_enter (Button).

```
activity_main.xml
<?xml version="1.0" encoding="utf-8"?>
<android.support.constraint.ConstraintLayout xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    tools:context=".MainActivity">

    <TextView
        android:id="@+id/txt_check"
        android:layout_width="wrap_content"
        android:layout_height="23dp"
        android:layout_marginBottom="160dp"
        android:visibility="visible"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintHorizontal_bias="0.501"
        app:layout_constraintLeft_toLeftOf="parent"
        app:layout_constraintRight_toRightOf="parent" />

    <EditText
        android:id="@+id(edt_pass_fst"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginEnd="20dp"
        android:layout_marginEnd="85dp"
        android:layout_marginStart="84dp"
        android:layout_marginTop="116dp"
        android:ems="10"
        android:inputType="textPassword"
        android:text="Please enter password"
        app:layout_constraintBottom_toTopOf="@+id(edt_pass_sec"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent" />

    <EditText
        android:id="@+id(edt_pass_sec"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginBottom="15dp"
        android:layout_marginEnd="85dp"
        android:layout_marginStart="84dp"
        android:layout_marginTop="25dp"
        android:ems="10"
        android:inputType="textPassword"
        android:text="Please enter password"
        app:layout_constraintBottom_toTopOf="@+id(btn_pass_enter"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toBottomOf="@+id(edt_pass_fst" />

    <Button
        android:id="@+id	btn_pass_enter"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginBottom="32dp"
        android:layout_marginEnd="119dp"
        android:layout_marginStart="119dp"
        android:layout_marginTop="16dp"
        android:text="Enter Password"
        app:layout_constraintBottom_toTopOf="@+id/txt_check"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toBottomOf="@+id(edt_pass_sec" />

</android.support.constraint.ConstraintLayout>
```

```
MainActivity.java
package com.example.judytung.ch2_25;

import ...

public class MainActivity extends AppCompatActivity {

    private Button btn_enterpass;
    private TextView txt_check;
    private EditText edt_pass1, edt_pass2;

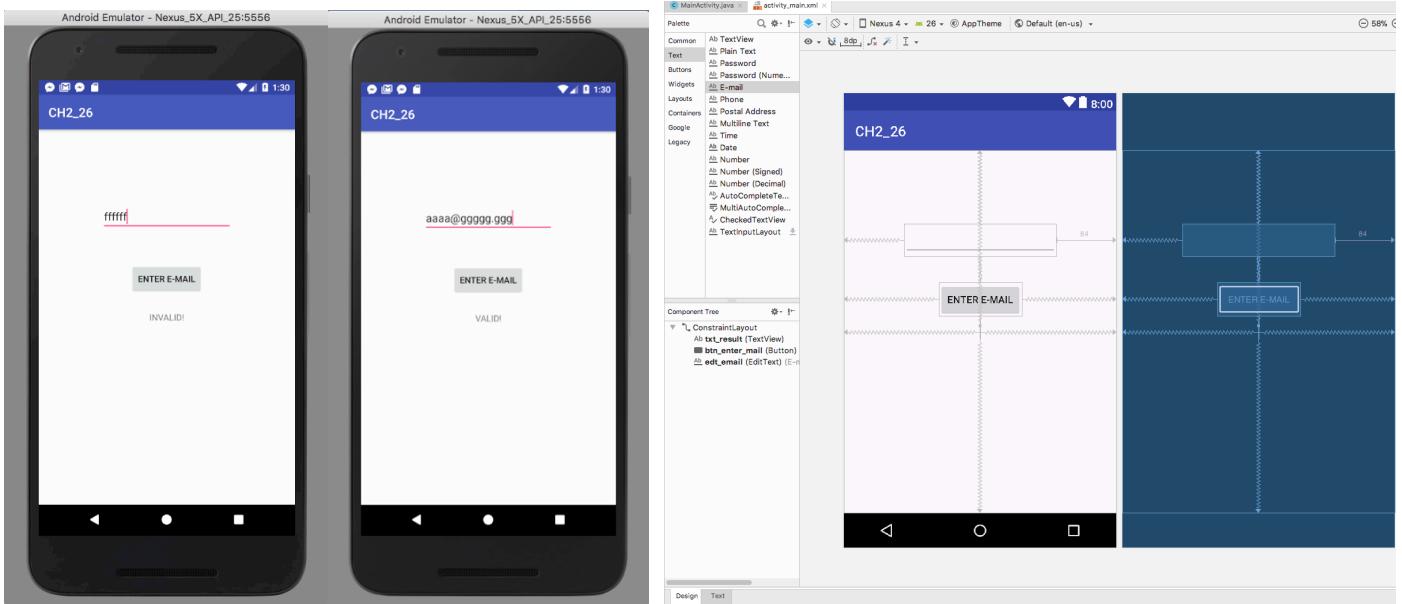
    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);

        btn_enterpass = (Button) findViewById(R.id.btn_pass_enter);
        txt_check = (TextView) findViewById(R.id.txt_check);
        edt_pass1 = (EditText) findViewById(R.id.edt_pass_fst);
        edt_pass2 = (EditText) findViewById(R.id.edt_pass_sec);

        btn_enterpass.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                String pass1 = edt_pass1.getText().toString();
                String pass2 = edt_pass2.getText().toString();

                if (pass1.equals(pass2))
                    txt_check.setText("THANK YOU!");
                else
                    txt_check.setText("PASSWORD MUST MATCH!");
            }
        });
    }
}
```

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The screenshot shows the Java code and XML layout files for the application.

**MainActivity.java** (Left):

```
1 <?xml version="1.0" encoding="utf-8"?>
2 <android.support.constraint.ConstraintLayout xmlns:android="http://schemas.android.com/apk/res/android"
3     xmlns:app="http://schemas.android.com/apk/res-auto"
4     xmlns:tools="http://schemas.android.com/tools"
5     android:layout_width="match_parent"
6     android:layout_height="match_parent"
7     tools:context=".MainActivity">
8
9     <TextView
10        android:id="@+id/txt_result"
11        android:layout_width="wrap_content"
12        android:layout_height="wrap_content"
13        app:layout_constraintBottom_toBottomOf="parent"
14        app:layout_constraintLeft_toLeftOf="parent"
15        app:layout_constraintRight_toRightOf="parent"
16        app:layout_constraintTop_toTopOf="parent" />
17
18     <Button
19        android:id="@+id/btn_enter_mail"
20        android:layout_width="wrap_content"
21        android:layout_height="wrap_content"
22        android:layout_marginBottom="20dp"
23        android:layout_marginEnd="148dp"
24        android:layout_marginStart="148dp"
25        android:layout_marginTop="23dp"
26        android:text="Enter e-mail"
27        app:layout_constraintBottom_toTopOf="@+id/txt_result"
28        app:layout_constraintEnd_toEndOf="parent"
29        app:layout_constraintStart_toStartOf="parent"
30        app:layout_constraintTop_toBottomOf="@+id/edt_email" />
31
32     <EditText
33        android:id="@+id/edt_email"
34        android:layout_width="wrap_content"
35        android:layout_height="wrap_content"
36        android:layout_marginBottom="23dp"
37        android:layout_marginEnd="84dp"
38        android:layout_marginStart="85dp"
39        android:layout_marginTop="110dp"
40        android:ems="10"
41        android:inputType="textEmailAddress"
42        app:layout_constraintBottom_toTopOf="@+id/btn_enter_mail"
43        app:layout_constraintEnd_toEndOf="parent"
44        app:layout_constraintStart_toStartOf="parent"
45        app:layout_constraintTop_toTopOf="parent" />
46
47 </android.support.constraint.ConstraintLayout>
```

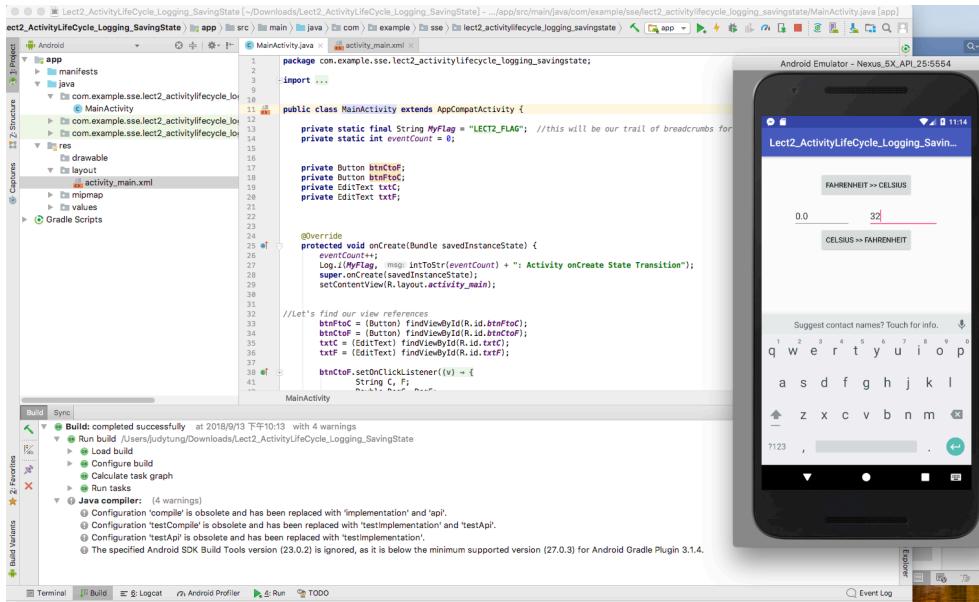
**MainActivity.java** (Right):

```
1 package com.example.judytung.ch2_26;
2
3 import ...
4
5 public class MainActivity extends AppCompatActivity {
6
7     private Button btn_enter_mail;
8     private TextView txt_result;
9     private EditText edt_email;
10
11     @Override
12     protected void onCreate(Bundle savedInstanceState) {
13         super.onCreate(savedInstanceState);
14         setContentView(R.layout.activity_main);
15
16         btn_enter_mail = (Button) findViewById(R.id.btn_enter_mail);
17         txt_result = (TextView) findViewById(R.id.txt_result);
18         edt_email = (EditText) findViewById(R.id.edt_email);
19
20         btn_enter_mail.setOnClickListener(new View.OnClickListener() {
21             @Override
22             public void onClick(View v) {
23                 String mail = edt_email.getText().toString();
24
25                 if (mail.contains("@"))
26                     txt_result.setText("VALID!");
27                 else
28                     txt_result.setText("INVALID!");
29             }
30         });
31     }
32 }
```

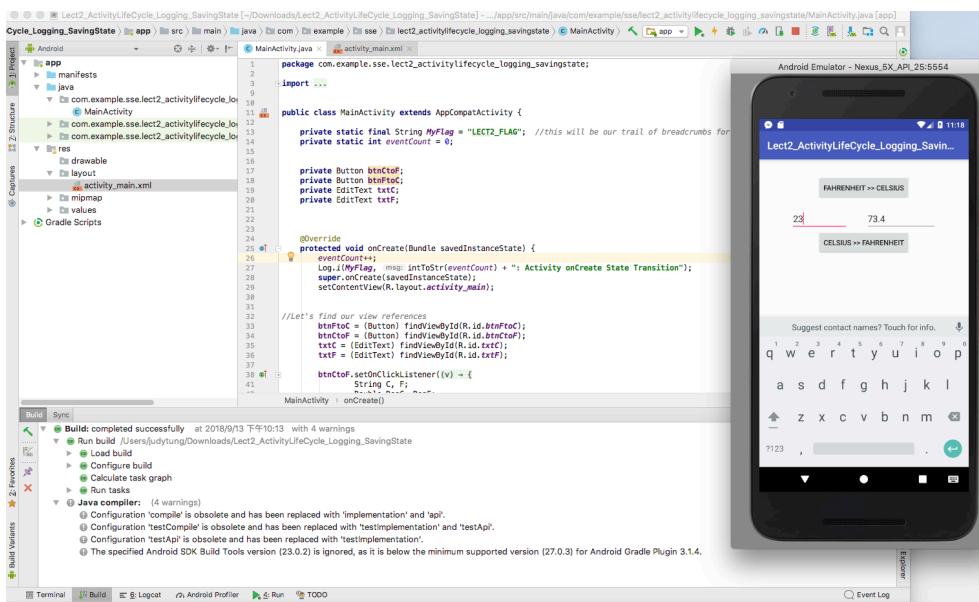
# Worksheet

## Part 2.

### Fahrenheit > Celsius



### Celsius > Fahrenheit



### .java file of MainActivity

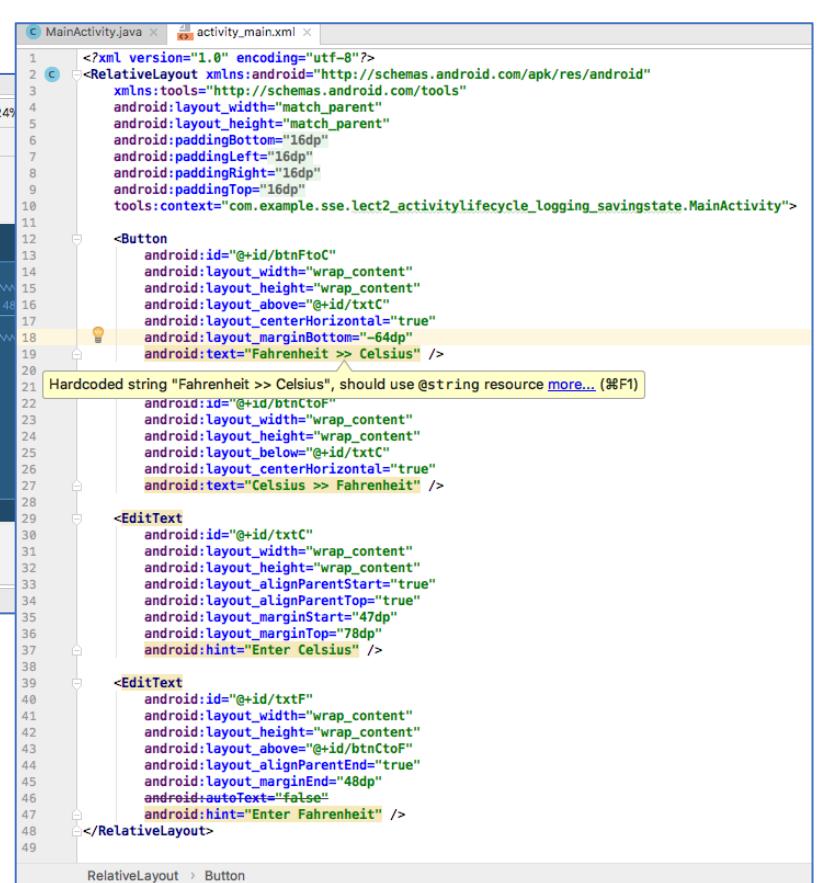
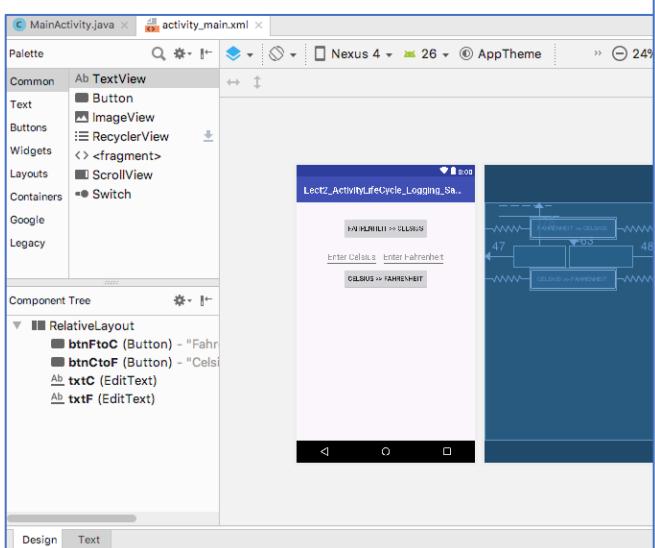
```
1 package com.example.sse.lect2_activitylifecycle_logging_savingstate;
2
3 import ...
4
5 public class MainActivity extends AppCompatActivity {
6
7     private static final String MyFlag = "LECT2_FLAG"; //this will be our trail of breadcrumbs for
8     private static int eventCount = 0;
9
10    private Button btnCtoF;
11    private Button btnFtoC;
12    private EditText txtC;
13    private EditText txtF;
14
15    @Override
16    protected void onCreate(Bundle savedInstanceState) {
17        eventCount++;
18        Log.i(MyFlag, msg: intToStr(eventCount) + ": Activity onCreate State Transition");
19        super.onCreate(savedInstanceState);
20        setContentView(R.layout.activity_main);
21
22        //Let's find our view references
23        btnFtoC = (Button) findViewById(R.id.btnFtoC);
24        btnCtoF = (Button) findViewById(R.id.btnCtoF);
25        txtC = (EditText) findViewById(R.id.txtC);
26        txtF = (EditText) findViewById(R.id.txtF);
27
28        btnCtoF.setOnClickListener(v) -> {
29            String C, F;
30            Double DegC, DegF;
31            C = txtC.getText().toString();
32            DegC = Double.parseDouble(C);
33            DegF = DegC*9.0/5.0 + 32; //todo, dblcheck formula.
34            F = DegF.toString();
35            txtF.setText(F);
36        };
37
38        btnFtoC.setOnClickListener(v) -> {
39            String C, F;
40            Double DegC, DegF;
41            F = txtF.getText().toString();
42            DegF = Double.parseDouble(F);
43            DegC = (DegF-32)*5.0/9.0; //todo, dblcheck formula.
44            C = DegC.toString();
45            txtC.setText(C);
46        };
47
48    }
49
50    @Override
51    protected void onPause() {
52        eventCount++;
53        Log.i(MyFlag, msg: intToStr(eventCount) + ": Activity onPause State Transition");
54        super.onPause();
55    }
56
57    //Useful Notes:
58    // ctrl-0 is a shortcut to override base methods
59    // Alt-Ins is a shortcut to overriding base methods and more.
60
61
62
63
64
65
66
67
68
69
69 }
```

```

71     @Override
72     protected void onStart() {
73         eventCount++;
74         Log.i(MyFlag, msg: intToStr(eventCount) + ": Activity onStart State Transition");
75         super.onStart();
76     }
77
78     @Override
79     protected void onSaveInstanceState(Bundle outState) {
80         eventCount++;
81         Log.i(MyFlag, msg: intToStr(eventCount) + ": Activity onSaveInstanceState State Transition");
82         Log.i(MyFlag, msg: "Bundling State of our views before they get destroyed");
83         super.onSaveInstanceState(outState);
84     }
85
86     @Override
87     protected void onRestoreInstanceState(Bundle savedInstanceState) {
88         eventCount++;
89         Log.i(MyFlag, msg: intToStr(eventCount) + ": Activity onRestoreInstanceState State Transition");
90         Log.i(MyFlag, msg: "Retrieving our saved state from before... ");
91         super.onRestoreInstanceState(savedInstanceState);
92     }
93
94     @Override
95     protected void onResume() {
96         eventCount++;
97         Log.i(MyFlag, msg: intToStr(eventCount) + ": Activity onResume State Transition");
98         super.onResume();
99     }
100
101 //Handy Helpers...
102     public String intToStr(Integer i) { return i.toString(); }
103
104     public int strToInt(String S) { return Integer.parseInt(S); }
105 }

```

## .xml file



## Part 3.

a.

The screenshot shows the Android Studio interface with the project structure and code editor for `MainActivity.java`. The code implements `onSaveInstanceState` to save a string. The application is running on an `Nexus_5X API 24` emulator, displaying a button labeled "CLICK ME" and a text input field with placeholder text "Put some text here". The logcat output shows the string being saved and restored correctly.

```

public void Jerry(View v) {
    Toast.makeText(getApplicationContext(), text: "Hello LATE Binding",Toast.LENGTH_LONG).show();
}

@Override
protected void onStart() {
    Log.i(tag: "Patriots", msg: "onStart Called.");
    super.onStart();
}

@Override
protected void onRestoreInstanceState(Bundle savedInstanceState) {
    Log.i(tag: "Patriots", msg: "onRestoreInstanceState Called.");
    super.onRestoreInstanceState(savedInstanceState);
}

protected void onSaveInstanceState(Bundle savedInstanceState) {
    Log.i(tag: "Patriots", msg: "onSaveInstanceState Called.");
    super.onSaveInstanceState(savedInstanceState);
}

@Override
protected void onRestart() {
    Log.i(tag: "Patriots", msg: "onRestart Called.");
    super.onRestart();
}

protected void onPause() {
    Log.i(tag: "Patriots", msg: "onPause Called.");
    super.onPause();
}

protected void onStop() {
    Log.i(tag: "Patriots", msg: "onStop Called.");
    super.onStop();
}

MainActivity : onSaveInstanceState()

```

b.

The screenshot shows the Android Studio interface with the project structure and code editor for `MainActivity.java`. The code implements `onSaveInstanceState` to save a string. The application is running on an `Nexus_5X API 24` emulator, displaying a button labeled "CLICK ME" and a text input field with placeholder text "Put some text here". The logcat output shows the string being saved and restored correctly.

```

public void Jerry(View v) {
    Toast.makeText(getApplicationContext(), text: "Hello LATE Binding",Toast.LENGTH_LONG).show();
}

@Override
protected void onStart() {
    Log.i(tag: "Patriots", msg: "onStart Called.");
    super.onStart();
}

@Override
protected void onRestoreInstanceState(Bundle savedInstanceState) {
    Log.i(tag: "Patriots", msg: "onRestoreInstanceState Called.");
    super.onRestoreInstanceState(savedInstanceState);
}

protected void onSaveInstanceState(Bundle savedInstanceState) {
    Log.i(tag: "Patriots", msg: "onSaveInstanceState Called.");
    super.onSaveInstanceState(savedInstanceState);
}

@Override
protected void onRestart() {
    Log.i(tag: "Patriots", msg: "onRestart Called.");
    super.onRestart();
}

protected void onPause() {
    Log.i(tag: "Patriots", msg: "onPause Called.");
    super.onPause();
}

protected void onStop() {
    Log.i(tag: "Patriots", msg: "onStop Called.");
    super.onStop();
}

MainActivity : onSaveInstanceState()

```

c.

The screenshot shows the Android Studio interface with the project structure and code editor for `MainActivity.java`. The code implements `onSaveInstanceState` to save a string. The application is running on an `Nexus_5X API 24` emulator, displaying a button labeled "CLICK ME" and a text input field with placeholder text "Put some text here". The logcat output shows the string being saved and restored correctly.

```

public void Jerry(View v) {
    Toast.makeText(getApplicationContext(), text: "Hello LATE Binding",Toast.LENGTH_LONG).show();
}

@Override
protected void onStart() {
    Log.i(tag: "Patriots", msg: "onStart Called.");
    super.onStart();
}

@Override
protected void onRestoreInstanceState(Bundle savedInstanceState) {
    Log.i(tag: "Patriots", msg: "onRestoreInstanceState Called.");
    super.onRestoreInstanceState(savedInstanceState);
}

protected void onSaveInstanceState(Bundle savedInstanceState) {
    Log.i(tag: "Patriots", msg: "onSaveInstanceState Called.");
    super.onSaveInstanceState(savedInstanceState);
}

@Override
protected void onRestart() {
    Log.i(tag: "Patriots", msg: "onRestart Called.");
    super.onRestart();
}

protected void onPause() {
    Log.i(tag: "Patriots", msg: "onPause Called.");
    super.onPause();
}

protected void onStop() {
    Log.i(tag: "Patriots", msg: "onStop Called.");
    super.onStop();
}

protected void onDestroy() {
    Log.i(tag: "Patriots", msg: "onDestroy Called.");
    super.onDestroy();
}

MainActivity : onSaveInstanceState()

```

## d. Portrait -> Landscape

```

@Override
protected void onRestoreInstanceState(Bundle savedInstanceState) {
    Log.i(TAG, "Patriots", msg: "onRestoreInstanceState Called.");
    super.onRestoreInstanceState(savedInstanceState);
}

protected void onSaveInstanceState(Bundle savedInstanceState) {
    Log.i(TAG, "Patriots", msg: "onSaveInstanceState Called.");
    super.onSaveInstanceState(savedInstanceState);
}

@Override
protected void onStart() {
    super.onStart();
}

protected void onResume() {
    Log.i(TAG, "Patriots", msg: "onResume Called.");
    super.onResume();
}

protected void onPause() {
    Log.i(TAG, "Patriots", msg: "onPause Called.");
    super.onPause();
}

protected void onStop() {
    Log.i(TAG, "Patriots", msg: "onStop Called.");
    super.onStop();
}

protected void onDestroy() {
    Log.i(TAG, "Patriots", msg: "onDestroy Called.");
    super.onDestroy();
}

```

Logcat output:

```

09-13 22:47:59.242 2486-2486/com.example.sse.lect2_earlylatebinding_longclick_toasts_statechanges I/Patriots: onPause Called.
09-13 22:47:59.245 2486-2486/com.example.sse.lect2_earlylatebinding_longclick_toasts_statechanges I/Patriots: onStop Called.
09-13 22:47:59.277 2486-2486/com.example.sse.lect2_earlylatebinding_longclick_toasts_statechanges I/Patriots: onRestart Called.
09-13 22:47:59.279 2486-2486/com.example.sse.lect2_earlylatebinding_longclick_toasts_statechanges I/Patriots: onStart Called.
09-13 22:47:59.281 2486-2486/com.example.sse.lect2_earlylatebinding_longclick_toasts_statechanges I/Patriots: onResume Called.

```

## Landscape -> Portrait

```

@Override
protected void onRestoreInstanceState(Bundle savedInstanceState) {
    Log.i(TAG, "Patriots", msg: "onRestoreInstanceState Called.");
    super.onRestoreInstanceState(savedInstanceState);
}

protected void onSaveInstanceState(Bundle savedInstanceState) {
    Log.i(TAG, "Patriots", msg: "onSaveInstanceState Called.");
    super.onSaveInstanceState(savedInstanceState);
}

@Override
protected void onStart() {
    super.onStart();
}

protected void onResume() {
    Log.i(TAG, "Patriots", msg: "onResume Called.");
    super.onResume();
}

protected void onPause() {
    Log.i(TAG, "Patriots", msg: "onPause Called.");
    super.onPause();
}

protected void onStop() {
    Log.i(TAG, "Patriots", msg: "onStop Called.");
    super.onStop();
}

protected void onDestroy() {
    Log.i(TAG, "Patriots", msg: "onDestroy Called.");
    super.onDestroy();
}

```

Logcat output:

```

09-13 22:48:29.259 2486-2486/com.example.sse.lect2_earlylatebinding_longclick_toasts_statechanges I/Patriots: onPause Called.
09-13 22:48:29.278 2486-2486/com.example.sse.lect2_earlylatebinding_longclick_toasts_statechanges I/Patriots: onStop Called.
09-13 22:48:29.279 2486-2486/com.example.sse.lect2_earlylatebinding_longclick_toasts_statechanges I/Patriots: onRestart Called.
09-13 22:48:29.284 2486-2486/com.example.sse.lect2_earlylatebinding_longclick_toasts_statechanges I/Patriots: onStart Called.
09-13 22:48:29.287 2486-2486/com.example.sse.lect2_earlylatebinding_longclick_toasts_statechanges I/Patriots: onResume Called.

```

## e.

```

@Override
protected void onStart() {
    Log.i(TAG, "Patriots", msg: "onStart Called.");
    super.onStart();
}

@Override
protected void onRestoreInstanceState(Bundle savedInstanceState) {
    Log.i(TAG, "Patriots", msg: "onRestoreInstanceState Called.");
    super.onRestoreInstanceState(savedInstanceState);
}

protected void onSaveInstanceState(Bundle savedInstanceState) {
    Log.i(TAG, "Patriots", msg: "onSaveInstanceState Called.");
    super.onSaveInstanceState(savedInstanceState);
}

@Override
protected void onRestart() {
    super.onRestart();
}

protected void onResume() {
    Log.i(TAG, "Patriots", msg: "onResume Called.");
    super.onResume();
}

protected void onPause() {
    Log.i(TAG, "Patriots", msg: "onPause Called.");
    super.onPause();
}

protected void onStop() {
    Log.i(TAG, "Patriots", msg: "onStop Called.");
    super.onStop();
}

protected void onDestroy() {
    Log.i(TAG, "Patriots", msg: "onDestroy Called.");
    super.onDestroy();
}

```

Logcat output:

```

09-13 22:51:59.739 4626-4626/com.example.sse.lect2_earlylatebinding_longclick_toasts_statechanges I/Patriots: onPause Called.
09-13 22:51:59.819 4626-4626/com.example.sse.lect2_earlylatebinding_longclick_toasts_statechanges I/Patriots: onSaveInstanceState Called.
09-13 22:51:00.427 4626-4626/com.example.sse.lect2_earlylatebinding_longclick_toasts_statechanges I/Patriots: onStop Called.
09-13 22:51:17.262 4626-4626/com.example.sse.lect2_earlylatebinding_longclick_toasts_statechanges I/Patriots: onStart Called.
09-13 22:51:17.264 4626-4626/com.example.sse.lect2_earlylatebinding_longclick_toasts_statechanges I/Patriots: onResume Called.

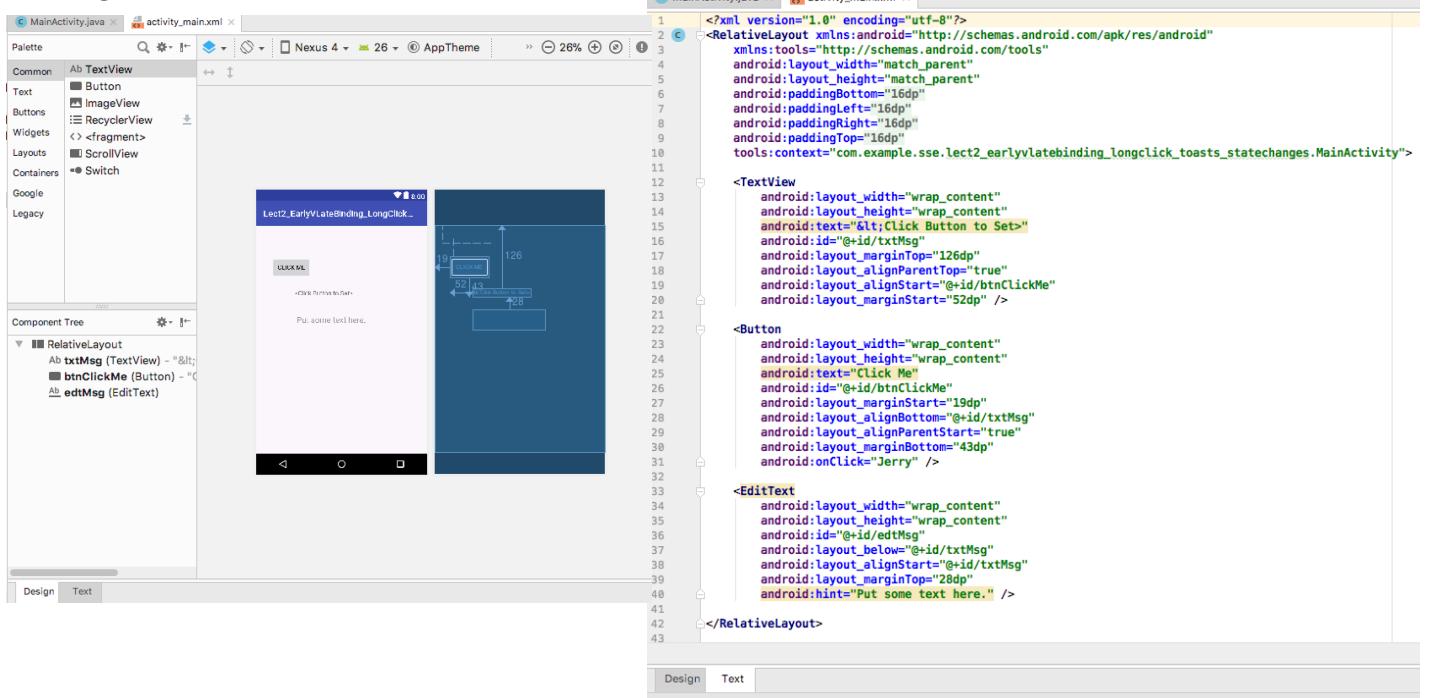
```

## .java file of MainActivity

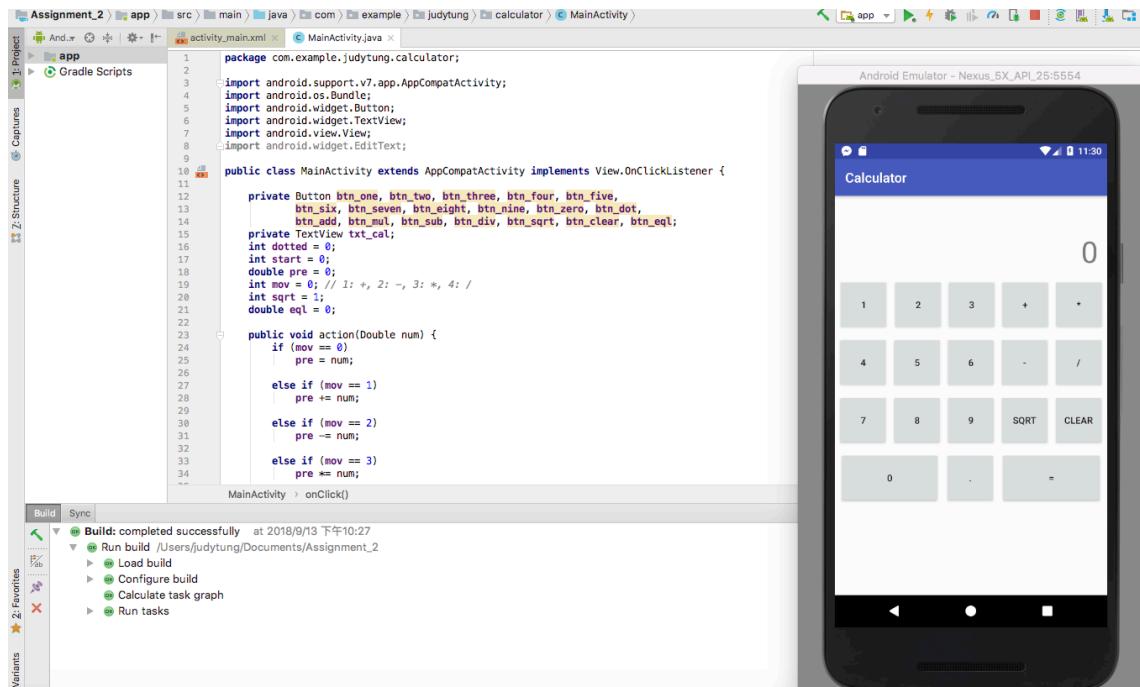
The image shows two side-by-side code editors. The left editor displays the MainActivity.java code, which includes imports for android.widget, android.view, and android.os. It defines a MainActivity class extending AppCompatActivity. Inside, it initializes EditText edtMsg, Button btnClickMe, and TextView txtMsg. It overrides onCreate, onClick, and onLongClick methods to set text and show toast messages. The right editor shows the ivy.java code, which contains various lifecycle methods (onCreate, onStart, onRestoreInstanceState, onSaveInstanceState, onRestart, onResume, onPause, onStop, onDestroy) that log messages indicating they have been called.

```
>MainActivity.java
1 package com.example.sse.lect2_earlylatebinding_longclick_toasts_statechanges;
2
3 import ...
4
5 public class MainActivity extends AppCompatActivity {
6
7     private EditText edtMsg;
8     private Button btnClickMe;
9     private TextView txtMsg;
10
11     @Override
12     protected void onCreate(Bundle savedInstanceState) {
13         Log.i("Patriots", msg: "onCreate Called.");
14         super.onCreate(savedInstanceState);
15         setContentView(< Android API 24 Platform > android.view
16             public class View extends Object
17                 edtMsg = implements Callback, AccessibilityEventSource
18                 txtMsg = (TextView) findViewById(R.id.txtMsg);
19                 btnClickMe = (Button) findViewById(R.id.btnClickMe);
20
21                 btnClickMe.setOnClickListener(new View.OnClickListener() {
22                     @Override
23                     public void onClick(View v) {
24                         edtMsg.setText("Hello Android");
25                         txtMsg.setText("Hello Android");
26                         Toast.makeText(getApplicationContext(), "Hello Android", Toast.LENGTH_LONG).show();
27                     }
28                 });
29
30                 btnClickMe.setOnLongClickListener(new View.OnLongClickListener() {
31                     @Override
32                     public boolean onLongClick(View v) {
33                         edtMsg.setText("Hello LongClick Listener");
34                         txtMsg.setText("Hello LongClick Listener");
35                         Toast.makeText(getApplicationContext(), "Hello LongClick Listener", Toast.LENGTH_LONG).show();
36                         return true;
37                     }
38                 });
39
40             public void btnClickMeOnClickEvent(View v){
41                 edtMsg.setText("Hello Early Binding");
42             }
43
44         }
45
46     }
47
48     ivy.java
49
50     public void btnClickMeOnClickEvent(View v){
51         edtMsg.setText("Hello Early Binding");
52         txtMsg.setText("Hello Early Binding");
53         Toast.makeText(getApplicationContext(), text: "Hello Early Binding",Toast.LENGTH_LONG).show();
54     }
55
56     public void Jerry(View v) {
57         Toast.makeText(getApplicationContext(), text: "Hello LATE Binding",Toast.LENGTH_LONG).show();
58     }
59
60     @Override
61     protected void onStart() {
62         Log.i( tag: "Patriots", msg: "onStart Called.");
63         super.onStart();
64     }
65
66     @Override
67     protected void onRestoreInstanceState(Bundle savedInstanceState) {
68         Log.i( tag: "Patriots", msg: "onRestoreInstanceState Called.");
69         super.onRestoreInstanceState(savedInstanceState);
70     }
71
72     @Override
73     protected void onSaveInstanceState(Bundle savedInstanceState) {
74         Log.i( tag: "Patriots", msg: "onSaveInstanceState Called.");
75         super.onSaveInstanceState(savedInstanceState);
76     }
77
78     @Override
79     protected void onRestart() {
80         super.onRestart();
81     }
82
83     @Override
84     protected void onResume() {
85         Log.i( tag: "Patriots", msg: "onResume Called.");
86         super.onResume();
87     }
88
89     @Override
90     protected void onPause() {
91         Log.i( tag: "Patriots", msg: "onPause Called.");
92         super.onPause();
93     }
94
95     @Override
96     protected void onStop() {
97         Log.i( tag: "Patriots", msg: "onStop Called.");
98         super.onStop();
99     }
100
101    protected void onDestroy() {
102        Log.i( tag: "Patriots", msg: "onDestroy Called.");
103        super.onDestroy();
104    }
105
106    Activity
```

## .xml file



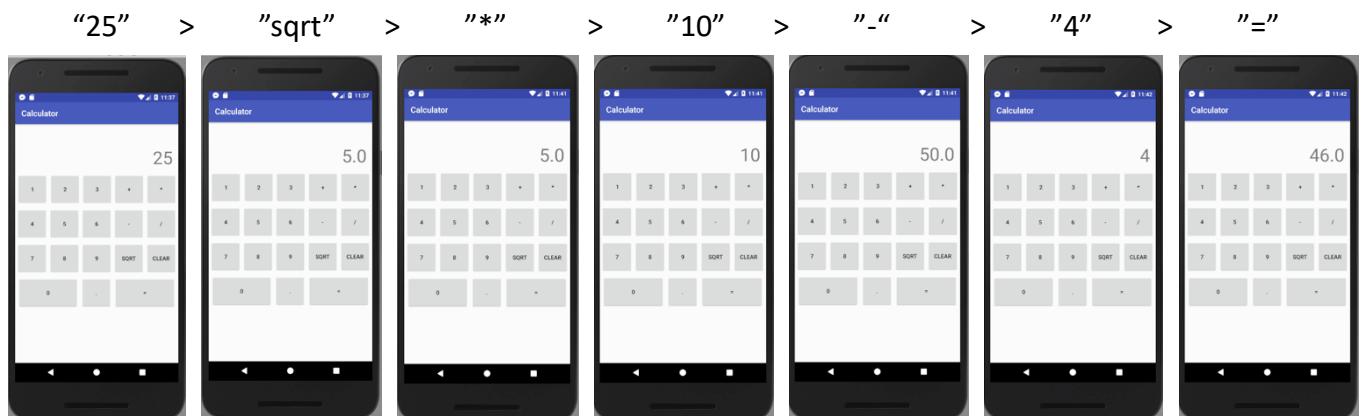
## Part 4.



### Test 1:



### Test 2:



### Test 3:



### .java file of MainActivity

```

activity_main.xml x MainActivity.java x
1 package com.example.judytung.calculator;
2
3 import android.support.v7.app.AppCompatActivity;
4 import android.os.Bundle;
5 import android.widget.Button;
6 import android.widget.TextView;
7 import android.view.View;
8 import android.widget.EditText;
9
10 public class MainActivity extends AppCompatActivity implements View.OnClickListener {
11
12     private Button btn_one, btn_two, btn_three, btn_four, btn_five,
13             btn_six, btn_seven, btn_eight, btn_nine, btn_zero, btn_dot,
14             btn_add, btn_mul, btn_sub, btn_div, btn_sqrt, btn_clear, btn.eql;
15     private TextView txt_cal;
16     int dotted = 0;
17     int start = 0;
18     double pre = 0;
19     int mov = 0; // 1: +, 2: -, 3: *, 4: /
20     int sqrt = 1;
21     double eql = 0;
22
23     public void action(Double num) {
24         if (mov == 0)
25             pre = num;
26
27         else if (mov == 1)
28             pre += num;
29
30         else if (mov == 2)
31             pre -= num;
32
33         else if (mov == 3)
34             pre *= num;
35
36         else if (mov == 4)
37             pre /= num;
38
39         else if (mov == 5)
40             pre = (Double) Math.sqrt(num);
41     }
42
43     @Override
44     protected void onCreate(Bundle savedInstanceState) {
45         super.onCreate(savedInstanceState);
46         setContentView(R.layout.activity_main);
47
48         btn_one = (Button) findViewById(R.id.btn_one);
49         btn_two = (Button) findViewById(R.id.btn_two);
50         btn_three = (Button) findViewById(R.id.btn_three);
51         btn_four = (Button) findViewById(R.id.btn_four);
52         btn_five = (Button) findViewById(R.id.btn_five);
53         btn_six = (Button) findViewById(R.id.btn_six);
54         btn_seven = (Button) findViewById(R.id.btn_seven);
55         btn_eight = (Button) findViewById(R.id.btn_eight);
56         btn_nine = (Button) findViewById(R.id.btn_nine);
57         btn_zero = (Button) findViewById(R.id.btn_zero);
58         btn_dot = (Button) findViewById(R.id.btn_dot);
59         btn_clear = (Button) findViewById(R.id.btn_clear);
60         btn_add = (Button) findViewById(R.id.btn_add);
61         btn_mul = (Button) findViewById(R.id.btn_mul);
62         btn_sub = (Button) findViewById(R.id.btn_sub);
63         btn_div = (Button) findViewById(R.id.btn_div);
64         btn_sqrt = (Button) findViewById(R.id.btn_sqrt);
65         btn.eql = (Button) findViewById(R.id.btn.eql);
66
67         txt_cal = (TextView) findViewById(R.id.txt_cal);
68
69         btn_one.setOnClickListener(this);
70         btn_two.setOnClickListener(this);
71         btn_three.setOnClickListener(this);
72         btn_four.setOnClickListener(this);
73         btn_five.setOnClickListener(this);
74         btn_six.setOnClickListener(this);
75         btn_seven.setOnClickListener(this);
76         btn_eight.setOnClickListener(this);
77         btn_nine.setOnClickListener(this);
78         btn_zero.setOnClickListener(this);
79         btn_dot.setOnClickListener(this);
80         btn_clear.setOnClickListener(this);
81         btn.add.setOnClickListener(this);
82         btn.mul.setOnClickListener(this);
83         btn.sub.setOnClickListener(this);
84         btn.div.setOnClickListener(this);
85         btn.sqrt.setOnClickListener(this);
86         btn.eql.setOnClickListener(this);
87     }

```



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    case R.id.btn_nine: {
        if (start == 0) {
            str_cal = "9";
            start = 1;
        }
        else
            str_cal += "9";
        txt_cal.setText(str_cal);
    }
    break;
}
case R.id.btn_zero: {
    if (start == 0) {
        str_cal = "0";
        start = 0;
    }
    else
        str_cal += "0";
    txt_cal.setText(str_cal);
}
break;
}
case R.id.btn_dot: {
    if (dotted == 0) {
        str_cal += ".";
        start = 1;
        dotted = 1;
    }
    txt_cal.setText(str_cal);
}
break;
}
case R.id.btn_clear: {
    str_cal = "0";
    start = 0;
    dotted = 0;
    pre = 0;
    mov = 0;
    txt_cal.setText(str_cal);
    sqrt = 1;
}
break;
}
case R.id.btn_add: {
    String tmp = txt_cal.getText().toString();
    Double num = Double.parseDouble(tmp);

    action(num);
    Double tmp_pre = pre;
    str_cal = tmp_pre.toString();
    txt_cal.setText(str_cal);

    mov = 1;
    start = 0;
    dotted = 0;
    sqrt = 0;
    eql = 0;
}
break;
}
case R.id.btn_sub: {
    String tmp = txt_cal.getText().toString();
    Double num = Double.parseDouble(tmp);

    action(num);
    Double tmp_pre = pre;
    str_cal = tmp_pre.toString();
    txt_cal.setText(str_cal);

    mov = 2;
    start = 0;
    dotted = 0;
    sqrt = 0;
    eql = 0;
}
break;
}

    case R.id.btn_mul: {
        String tmp = txt_cal.getText().toString();
        Double num = Double.parseDouble(tmp);

        action(num);
        Double tmp_pre = pre;
        str_cal = tmp_pre.toString();
        txt_cal.setText(str_cal);

        mov = 3;
        start = 0;
        dotted = 0;
        sqrt = 0;
        eql = 0;
    }
    break;
}
case R.id.btn_div: {
    String tmp = txt_cal.getText().toString();
    Double num = Double.parseDouble(tmp);

    action(num);
    Double tmp_pre = pre;
    str_cal = tmp_pre.toString();
    txt_cal.setText(str_cal);

    mov = 4;
    start = 0;
    dotted = 0;
    sqrt = 0;
    eql = 0;
}
break;
}
case R.id.btn_sqrt: {
    if (sqrt == 1) {
        String tmp = txt_cal.getText().toString();
        Double num = Double.parseDouble(tmp);

        mov = 5;
        action(num);
        Double tmp_pre = pre;
        str_cal = tmp_pre.toString();
        txt_cal.setText(str_cal);

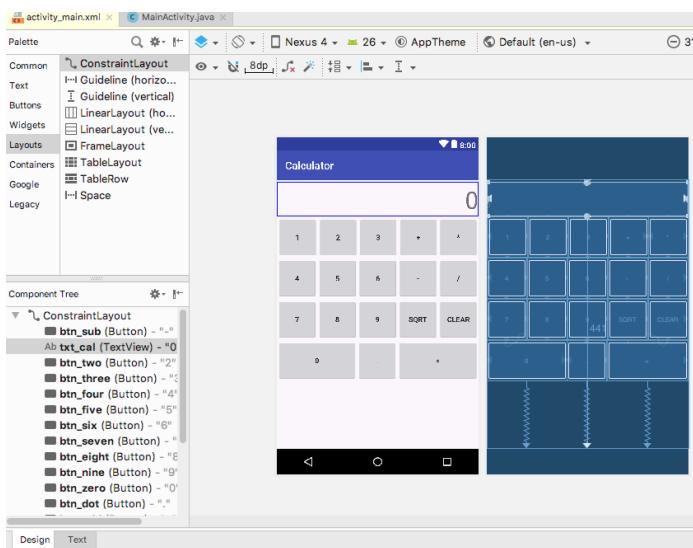
        start = 0;
        dotted = 0;
        eql = 0;
        mov = 0;
    }
    break;
}
case R.id.btn.eql: {
    if (eql == 0 || mov == 5) {
        String tmp = txt_cal.getText().toString();
        Double num = Double.parseDouble(tmp);

        action(num);
        eql = num;
        Double tmp_pre = pre;
        str_cal = tmp_pre.toString();
        txt_cal.setText(str_cal);
    }
    else {
        action(eql);
        Double tmp_pre = pre;
        str_cal = tmp_pre.toString();
        txt_cal.setText(str_cal);
    }

    start = 0;
    dotted = 0;
    sqrt = 1;
}
break;
}

```

## .xml file



```
<?xml version="1.0" encoding="utf-8"?>
<android.support.constraint.ConstraintLayout xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    tools:context=".MainActivity">

    <Button
        android:id="@+id/btn_sub"
        android:layout_width="76dp"
        android:layout_height="78dp"
        android:text="-"
        app:layout_constraintBottom_toTopOf="@+id/btn_sqrt"
        app:layout_constraintEnd_toStartOf="@+id/btn_div"
        app:layout_constraintStart_toEndOf="@+id/btn_six"
        app:layout_constraintTop_toBottomOf="@+id/btn_add" />

    <TextView
        android:id="@+id/txt_cal"
        android:layout_width="383dp"
        android:layout_height="65dp"
        android:layout_marginBottom="441dp"
        android:layout_marginStart="1dp"
        android:layout_marginTop="5dp"
        android:text="0"
        android:textAppearance="@style/TextAppearance.AppCompat.Display2"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        android:gravity="center_vertical|right" />

    <Button
        android:id="@+id/btn_two"
        android:layout_width="76dp"
        android:layout_height="78dp"
        android:text="2"
        app:layout_constraintBottom_toTopOf="@+id/btn_five"
        app:layout_constraintEnd_toStartOf="@+id/btn_three"
        app:layout_constraintStart_toEndOf="@+id/btn_one"
        app:layout_constraintTop_toBottomOf="@+id/txt_cal" />

    <Button
        android:id="@+id/btn_three"
        android:layout_width="76dp"
        android:layout_height="78dp"
        android:text="3"
        app:layout_constraintBottom_toTopOf="@+id/btn_six"
        app:layout_constraintEnd_toStartOf="@+id/btn_two"
        app:layout_constraintStart_toEndOf="@+id/btn_one"
        app:layout_constraintTop_toBottomOf="@+id/txt_cal" />

    <Button
        android:id="@+id/btn_four"
        android:layout_width="76dp"
        android:layout_height="78dp"
        android:text="4"
        app:layout_constraintBottom_toTopOf="@+id/btn_seven"
        app:layout_constraintEnd_toStartOf="@+id/btn_five"
        app:layout_constraintStart_toEndOf="@+id/btn_two"
        app:layout_constraintTop_toBottomOf="@+id/btn_one" />

    <Button
        android:id="@+id/btn_five"
        android:layout_width="76dp"
        android:layout_height="78dp"
        android:text="5"
        app:layout_constraintBottom_toTopOf="@+id/btn_eight"
        app:layout_constraintEnd_toStartOf="@+id/btn_six"
        app:layout_constraintStart_toEndOf="@+id/btn_four"
        app:layout_constraintTop_toBottomOf="@+id/btn_two" />

    <Button
        android:id="@+id/btn_six"
        android:layout_width="76dp"
        android:layout_height="78dp"
        android:text="6"
        app:layout_constraintBottom_toTopOf="@+id/btn_nine"
        app:layout_constraintEnd_toStartOf="@+id/btn_sub"
        app:layout_constraintStart_toEndOf="@+id/btn_five"
        app:layout_constraintTop_toBottomOf="@+id/btn_three" />

    <Button
        android:id="@+id/btn_seven"
        android:layout_width="76dp"
        android:layout_height="78dp"
        android:text="7"
        app:layout_constraintBottom_toTopOf="@+id/btn_zero"
        app:layout_constraintEnd_toStartOf="@+id/btn_eight"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toBottomOf="@+id/btn_four" />
```

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<Button
    android:id="@+id/btn_eight"
    android:layout_width="76dp"
    android:layout_height="78dp"
    android:text="8"
    app:layout_constraintBottom_toTopOf="@+id/btn_zero"
    app:layout_constraintEnd_toStartOf="@+id/btn_nine"
    app:layout_constraintStart_toEndOf="@+id/btn_seven"
    app:layout_constraintTop_toBottomOf="@+id/btn_five" />
<Button
    android:id="@+id/btn_nine"
    android:layout_width="76dp"
    android:layout_height="78dp"
    android:text="9"
    app:layout_constraintBottom_toTopOf="@+id/btn_dot"
    app:layout_constraintEnd_toStartOf="@+id/btn_sqrt"
    app:layout_constraintStart_toEndOf="@+id/btn_eight"
    app:layout_constraintTop_toBottomOf="@+id/btn_six" />
<Button
    android:id="@+id/btn_zero"
    android:layout_width="152dp"
    android:layout_height="78dp"
    android:layout_marginBottom="129dp"
    android:text="0"
    app:layout_constraintBottom_toBottomOf="parent"
    app:layout_constraintEnd_toStartOf="@+id/btn_dot"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toBottomOf="@+id/btn_seven" />
<Button
    android:id="@+id/btn_dot"
    android:layout_width="76dp"
    android:layout_height="78dp"
    android:layout_marginBottom="129dp"
    android:text "."
    app:layout_constraintBottom_toBottomOf="parent"
    app:layout_constraintEnd_toStartOf="@+id/btn.eql"
    app:layout_constraintStart_toEndOf="@+id/btn_zero"
    app:layout_constraintTop_toBottomOf="@+id/btn_nine" />
<Button
    android:id="@+id/btn_add"
    android:layout_width="76dp"
    android:layout_height="78dp"
    android:text "+"
    app:layout_constraintBottom_toTopOf="@+id/btn_sub"
    app:layout_constraintEnd_toStartOf="@+id/btn_mul"
    app:layout_constraintStart_toEndOf="@+id/btn_three"
    app:layout_constraintTop_toBottomOf="@+id/txt_cal" />
<Button
    android:id="@+id/btn_mul"
    android:layout_width="76dp"
    android:layout_height="78dp"
    android:text "*"
    app:layout_constraintBottom_toTopOf="@+id/btn_div"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintStart_toEndOf="@+id/btn_add"
    app:layout_constraintTop_toBottomOf="@+id/txt_cal" />
<Button
    android:id="@+id/btn_clear"
    android:layout_width="76dp"
    android:layout_height="78dp"
    android:text="clear"
    app:layout_constraintBottom_toTopOf="@+id/btn.eql"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintStart_toEndOf="@+id/btn_sqrt"
    app:layout_constraintTop_toBottomOf="@+id/btn_div" />
<Button
    android:id="@+id/btn_div"
    android:layout_width="76dp"
    android:layout_height="78dp"
    android:text "/"
    app:layout_constraintBottom_toTopOf="@+id/btn_clear"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintStart_toEndOf="@+id/btn_sub"
    app:layout_constraintTop_toBottomOf="@+id/btn_mul" />
<Button
    android:id="@+id/btn_sqrt"
    android:layout_width="76dp"
    android:layout_height="78dp"
    android:text="sqrt"
    app:layout_constraintBottom_toTopOf="@+id/btn_dot"
    app:layout_constraintEnd_toStartOf="@+id/btn_clear"
    app:layout_constraintStart_toEndOf="@+id/btn_nine"
    app:layout_constraintTop_toBottomOf="@+id/btn_sub" />
<Button
    android:id="@+id/btn.eql"
    android:layout_width="154dp"
    android:layout_height="78dp"
    android:layout_marginBottom="129dp"
    android:text "="
    app:layout_constraintBottom_toBottomOf="parent"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintStart_toEndOf="@+id/btn_dot"
    app:layout_constraintTop_toBottomOf="@+id/btn_clear" />
<Button
    android:id="@+id/btn_one"
    android:layout_width="76dp"
    android:layout_height="78dp"
    android:layout_marginEnd="1dp"
    android:layout_marginStart="1dp"
    android:text "1"
    app:layout_constraintBottom_toTopOf="@+id/btn_four"
    app:layout_constraintEnd_toStartOf="@+id/btn_two"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toBottomOf="@+id/txt_cal" />
</android.support.constraint.ConstraintLayout>

```