



**Department of Information Science and Engineering**  
**Acharya Institute of Technology**  
Acharya Dr.Sarvepalli Radhakrishnan Road Bangalore-560107

**MOBILE APPLICATION DEVELOPMENT**

[As per Choice Based Credit System (CBCS) scheme - Effective from the academic year 2018-19]

|                                |            |            |      |
|--------------------------------|------------|------------|------|
| Semester                       | : VI       | I.A. Marks | : 40 |
| Course Code                    | : 18CSMP68 | Exam Marks | : 60 |
| Total Hours / Week (L : T : P) | : 0:0:2    | Exam Hours | : 03 |

**Laboratory Objectives:** This laboratory (18CSMP68) will enable students to

This course (18CSMP68) will enable students to:

- Learn and acquire the art of Android Programming.
- Configure Android studio to run the applications.
- Understand and implement Android's User interface functions.
- Create, modify and query on SQLite database.
- Inspect different methods of sharing data using services.

**Descriptions (if any):**

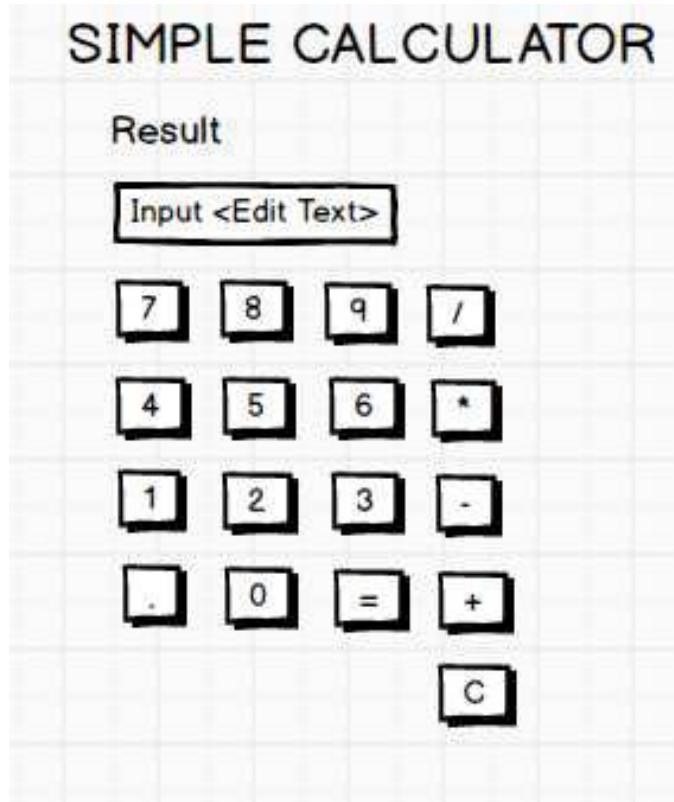
- Installation procedure of the Android Studio/Java software must be demonstrated, carried out in groups.
- Students should use the latest version of Android Studio/Java to execute these programs.
- All of these diagrams are for representational purpose only. Students are expected to improvise on it.

**Laboratory Programs:****PART A**

1. Create an application to design a Visiting Card. The Visiting card should have a company logo at the top right corner. The company name should be displayed in Capital letters, aligned to the center. Information like the name of the employee, job title, phone number, address, email, fax and the website address is to be displayed. Insert a horizontal line between the job title and the phone number.



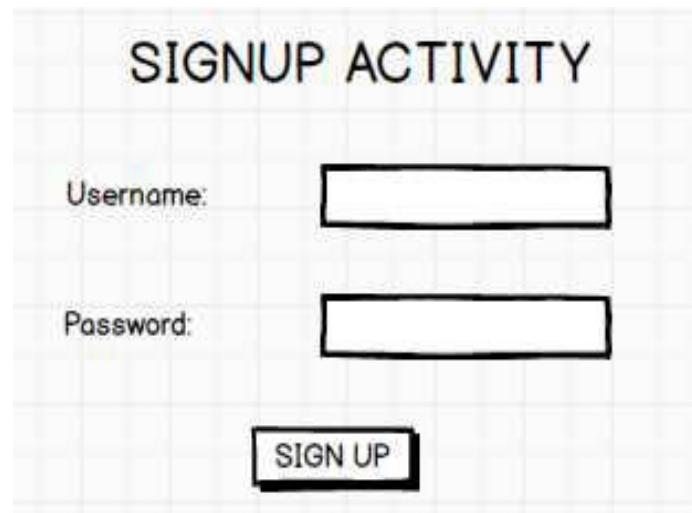
2. Develop an Android application using controls like Button, TextView, EditText for designing a calculator having basic functionality like Addition, Subtraction, Multiplication, and Division.



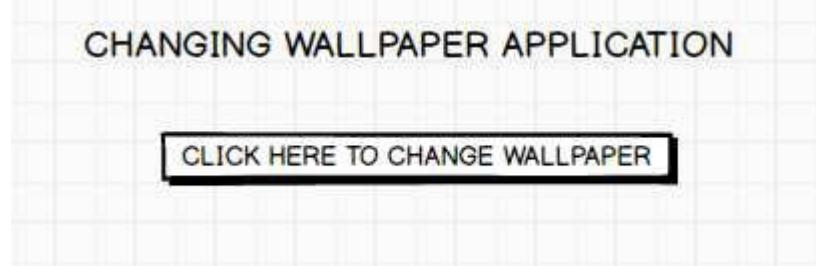
3. Create a SIGN Up activity with Username and Password. Validation of password should happen based on the following rules:

- Password should contain uppercase and lowercase letters.
- Password should contain letters and numbers.
- Password should contain special characters.
- Minimum length of the password (the default value is 8).

On successful **SIGN UP** proceed to the next Login activity. Here the user should **SIGNIN** using the Username and Password created during signup activity. If the Username and Password are matched then navigate to the next activity which displays a message saying “Successful Login” or else display a toast message saying “Login Failed”. The user is given only two attempts and after that display a toast message saying “Failed Login Attempts” and disable the SIGN IN button. Use Bundle to transfer information from one activity to another.



4. Develop an application to set an image as wallpaper. On click of a button, the wallpaper image Should start to change randomly every 30 seconds.



5. Write a program to create an activity with two buttons START and STOP. On pressing of the START button, the activity must start the counter by displaying the numbers from one and the counter must keep on counting until the STOP button is pressed. Display the counter value in a Text View control.



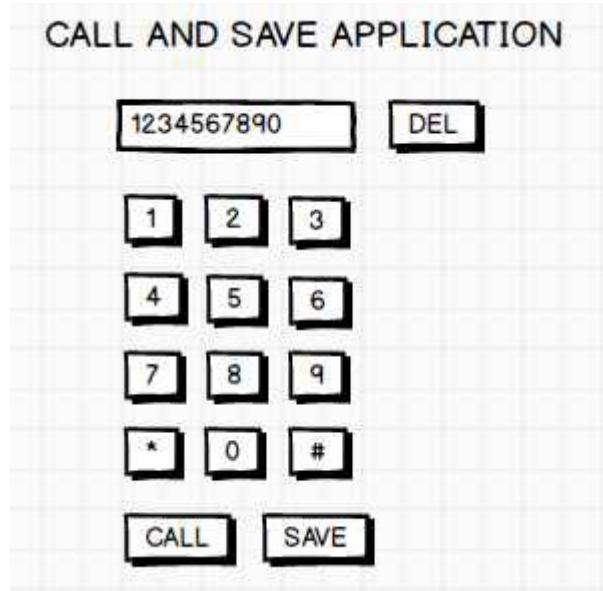
6. Create two files of XML and JSON type with values for City\_ Name, Latitude, Longitude, Temperature, and Humidity. Develop an application to create an activity with two buttons to parse the XML and JSON files which when clicked should display the data in their respective layouts side by side.

| PARSING XML AND JSON DATA |  |  |
|---------------------------|--|--|
| PARSING XML AND JSON DATA | XML DATA   | JSON Data  |
| <b>Parse XML Data</b>     | City_Name: Mysore<br>Latitude: 12.295<br>Longitude: 76.639<br>Temperature: 22<br>Humidity: 90% | City_Name: Mysore<br>Latitude: 12.295<br>Longitude: 76.639<br>Temperature: 22<br>Humidity: 90% |
| <b>Parse JSON Data</b>    |  |  |

7. Develop a simple application with one EditText so that the user can write some text in it. Create a button called “Convert Text to Speech” that converts the user input text into voice.

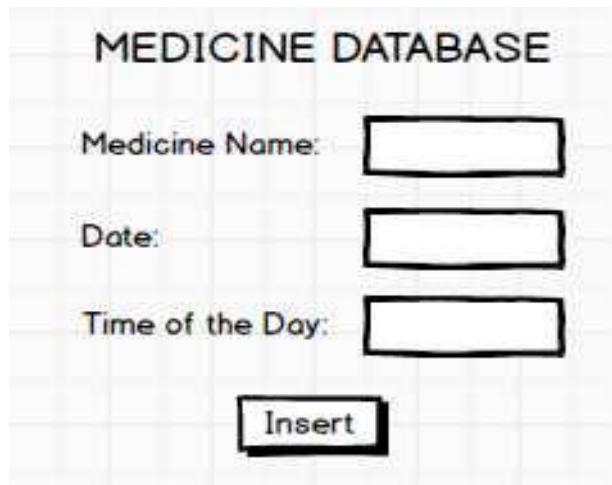


8. Create an activity like a phone dialer with CALL and SAVE buttons. On pressing the CALL button, it must call the phone number and on pressing the SAVE button it must save the number to the phone contacts.

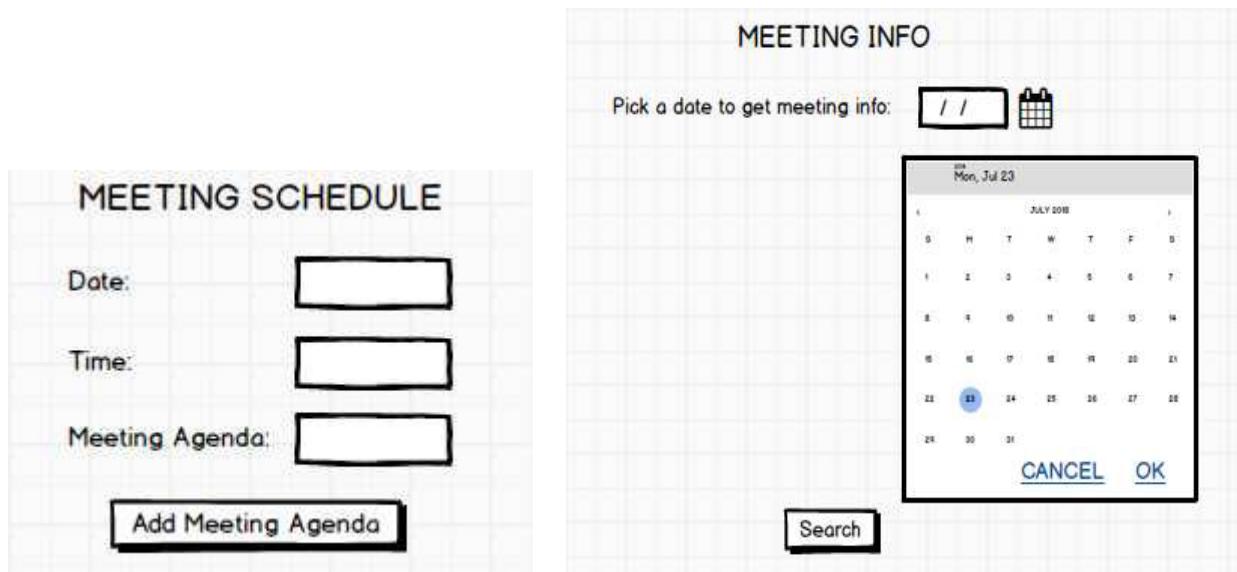


**PART B**

1. Write a program to enter Medicine Name, Date and Time of the Day as input from the user and store it in the SQLite database. Input for Time of the Day should be either Morning or Afternoon or Evening or Night. Trigger an alarm based on the Date and Time of the Day and display the Medicine Name.



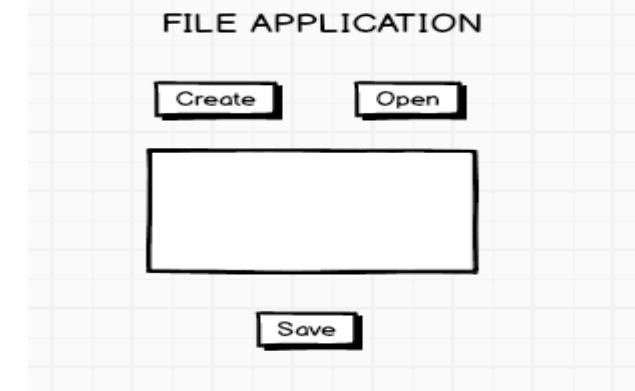
2. Develop a content provider application with an activity called "Meeting Schedule" which takes Date, Time and Meeting Agenda as input from the user and store this information into the SQLite database. Create another application with an activity called "Meeting Info" having Date Picker control, which on the selection of a date should display the Meeting Agenda information for that particular date, else it should display a toast message saying "No Meeting on this Date".



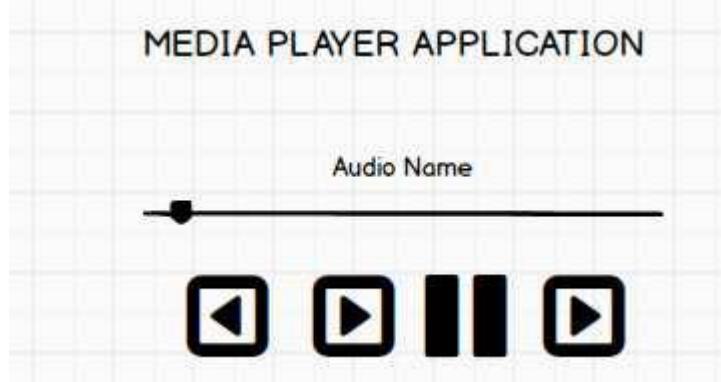
3. Create an application to receive an incoming SMS which is notified to the user. On clicking this SMS notification, the message content and the number should be displayed on the screen. Use appropriate emulator control to send the SMS message to your application.



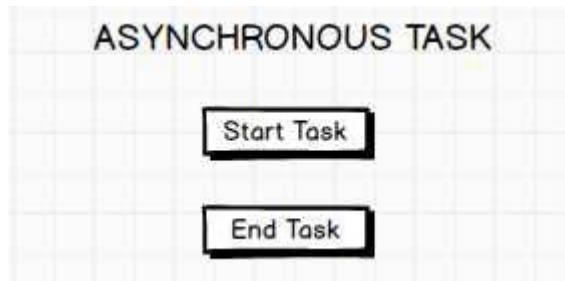
4. Write a program to create an activity having a Text box, and also Save, Open and Create buttons. The user has to write some text in the Text box. On pressing the Create button the text should be saved as a text file in MkSDcard. On subsequent changes to the text, the Save button should be pressed to store the latest content to the same file. On pressing the Open button, it should display the contents from the previously stored files in the Text box. If the user tries to save the contents in the Textbox to a file without creating it, then a toast message has to be displayed saying "First Create a File".



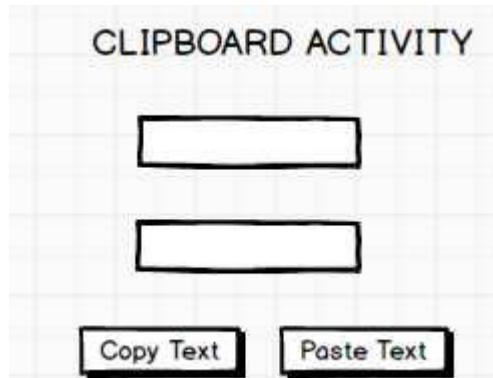
5. Create an application to demonstrate a basic media player that allows the user to Forward, Backward, Play and Pause an audio. Also, make use of the indicator in the seek bar to move the audio forward or backward as required.



6. Develop an application to demonstrate the use of Asynchronous tasks in android. The asynchronous task should implement the functionality of a simple moving banner. On pressing the **Start Task** button, the banner message should scroll from right to left. On pressing the **Stop Task** button, the banner message should stop. Let the banner message be “Demonstration of Asynchronous Task”.



7. Develop an application that makes use of the clipboard framework for copying and pasting of the text. The activity consists of two EditText controls and two Buttons to trigger the copy and paste functionality.



8. Create an AIDL service that calculates Car Loan EMI. The formula to calculate EMI is

$$E = P * (r(1+r)n)/((1+r)n-1)$$

where

E = The EMI payable on the car loan amount

P = The Car loan Principal Amount

r = The interest rate value computed on a monthly basis

n = The loan tenure in the form of months

The down payment amount has to be deducted from the principal amount paid towards buying the Car. Develop an application that makes use of this AIDL service to calculate the EMI. This application should have four EditText to read the Principal Amount, Down Payment, Interest Rate, Loan Term (in months) and a button named as “Calculate Monthly EMI”. On click of this button, the result should be shown in a TextView. Also, calculate the EMI by varying the Loan Term and Interest Rate values.

**Laboratory Outcomes:**

The student should be able to:

- Write algorithms, flowcharts and program for simple problems.
- Correct syntax and logical errors to execute a program.
- Write iterative and wherever possible recursive programs.
- Demonstrate use of functions, arrays, strings, structures and pointers in problem solving.

**Conduct of Practical Examination:**

- All laboratory experiments, excluding the first, are to be included for practical examination.
- Experiment distribution
  - For questions having only one part: Students are allowed to pick one experiment from the lot and are given equal opportunity.
  - For questions having part A and B: Students are allowed to pick one experiment from part A and one experiment from part B and are given equal opportunity.
- Strictly follow the instructions as printed on the cover page of answer script for breakup of marks
- Change of experiment is allowed only once and marks allotted for procedure part to be made zero.
- Marks Distribution (Subjected to change in accordance with university regulations)
  - a) For questions having only one part -  
Procedure + Execution + Viva-Voce:  $15+70+15 = 100$  Marks
  - b) For questions having part A and B
    - i. Part A - Procedure + Execution + Viva =  $4 + 21 + 5 = 30$  Marks
    - ii. Part B - Procedure + Execution + Viva =  $10 + 49 + 11 = 70$  Marks

## Android Studio Tutorials

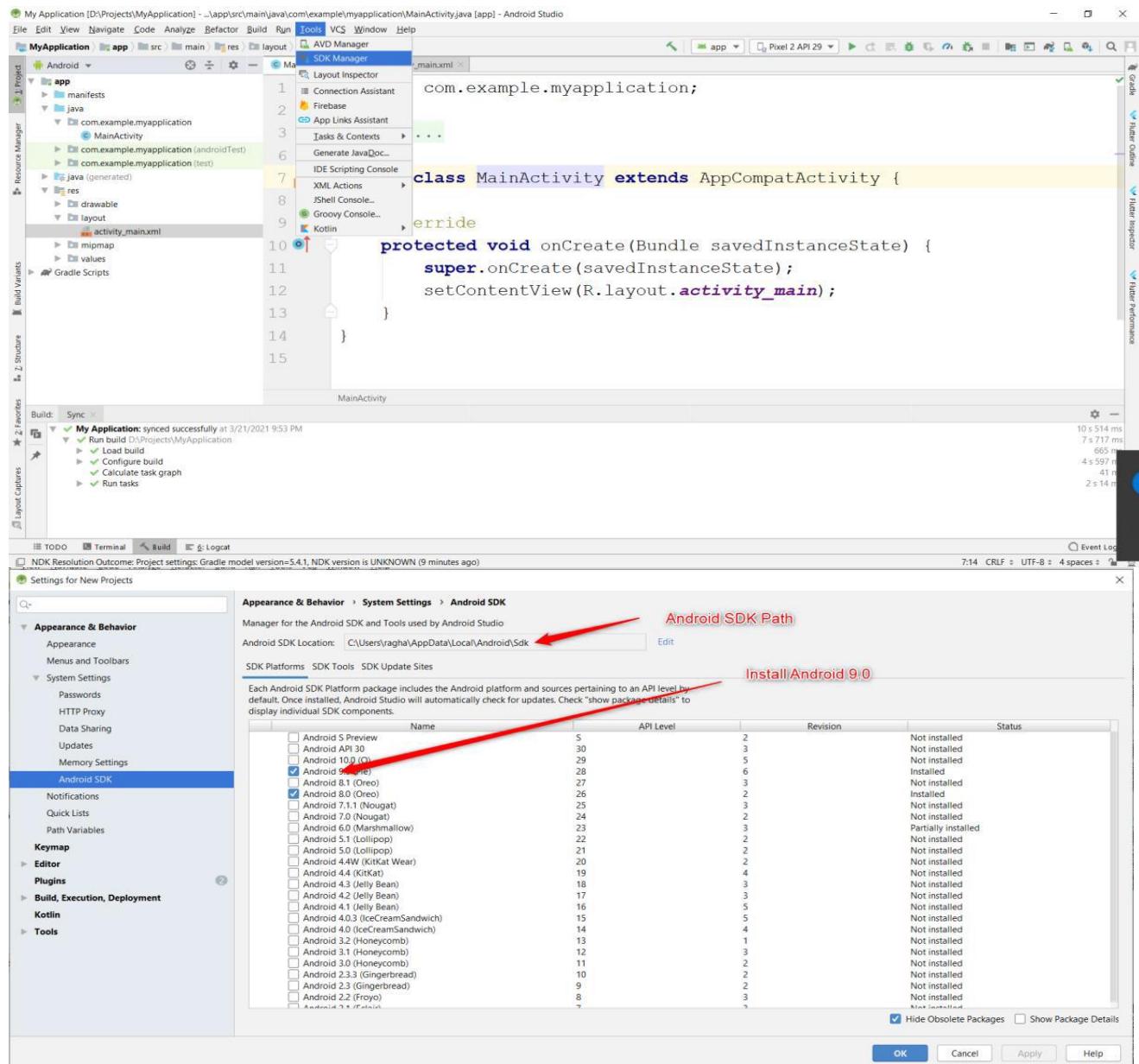
### Install Android Studio and Packages:

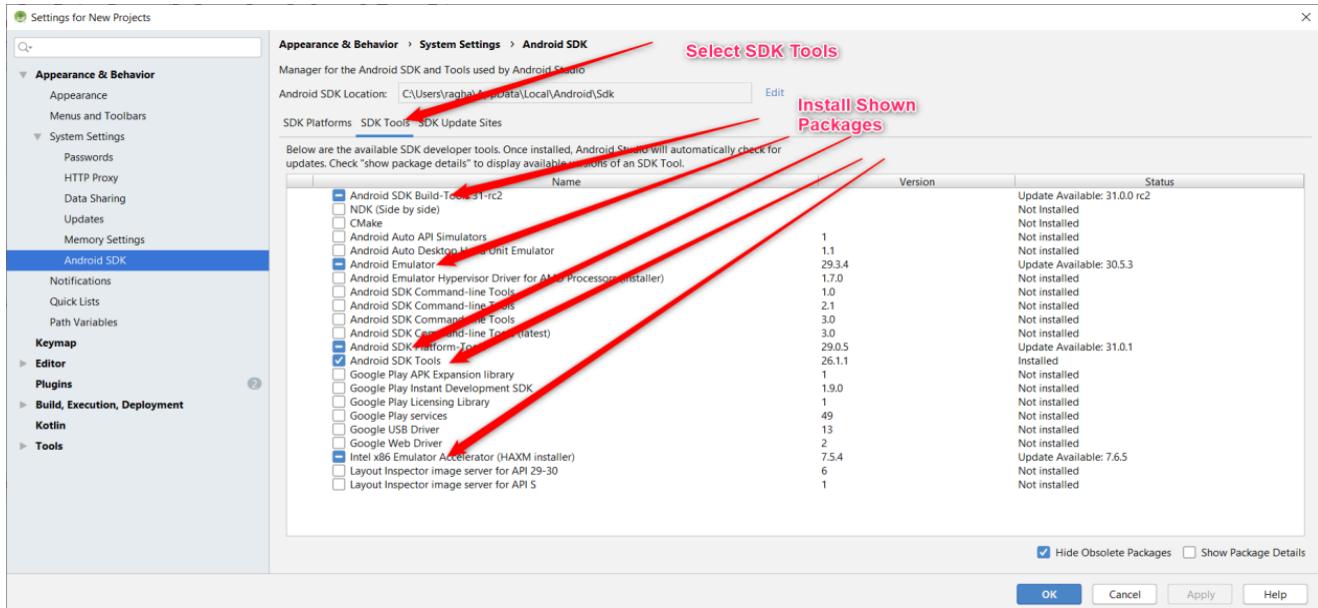
Download Android Version 4.0.2 from the below link

<https://redirector.gvt1.com/edgedl/android/studio/install/4.0.2.0/android-studio-ide-193.6821437-windows.exe>

### Configure Android SDK packages:

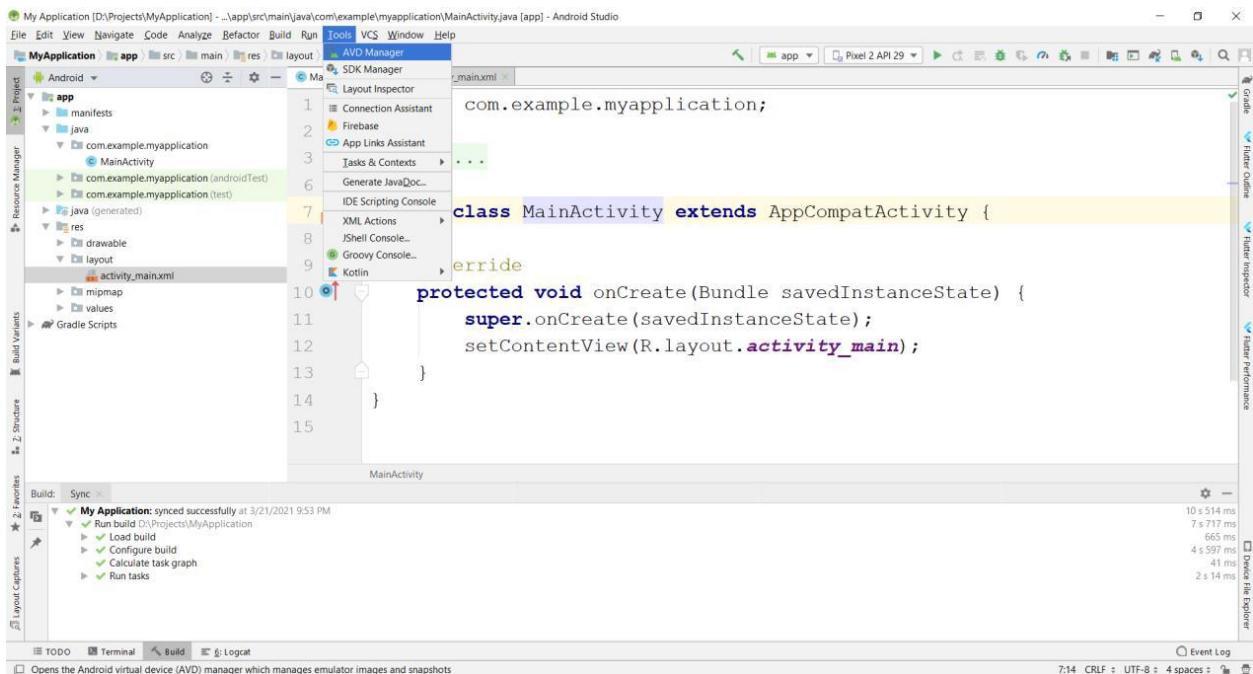
Go to Tools → SDK Manager

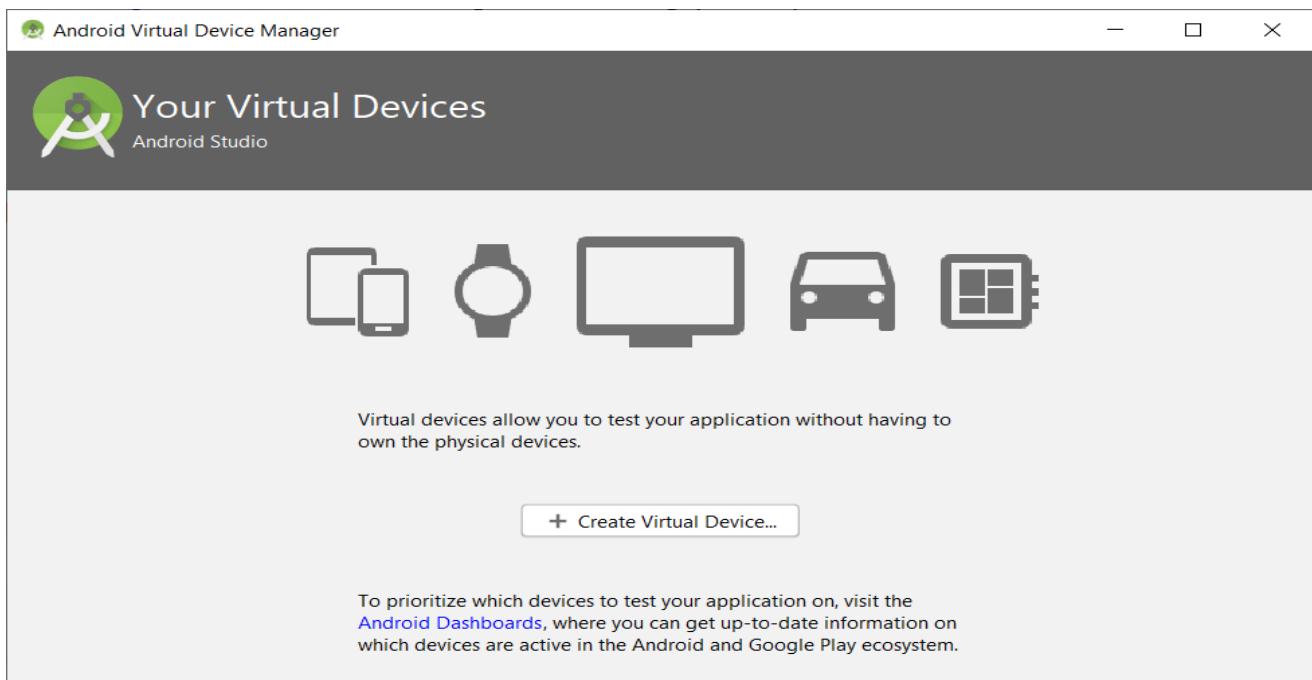




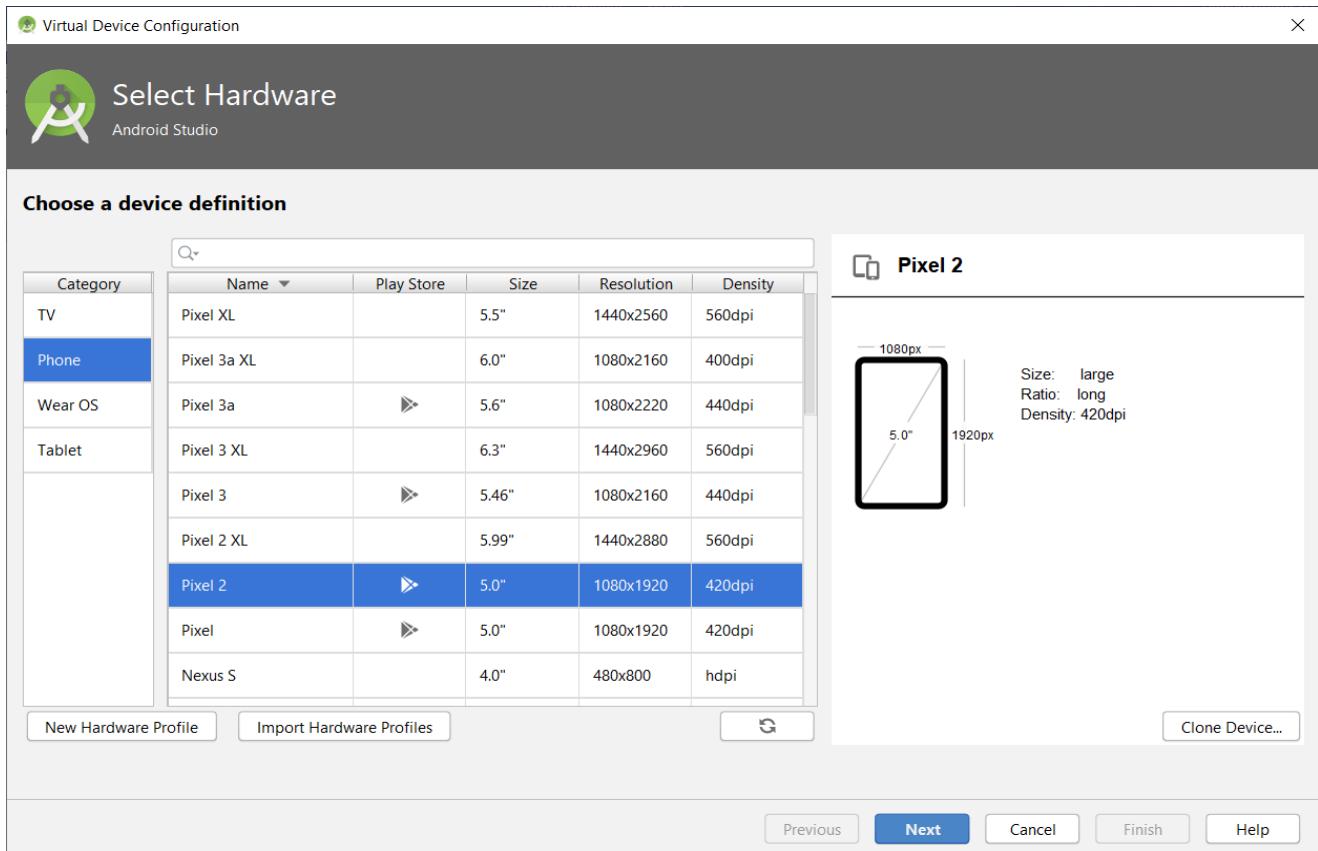
## Creating Emulator

Go to Tools → Select AVD Manager

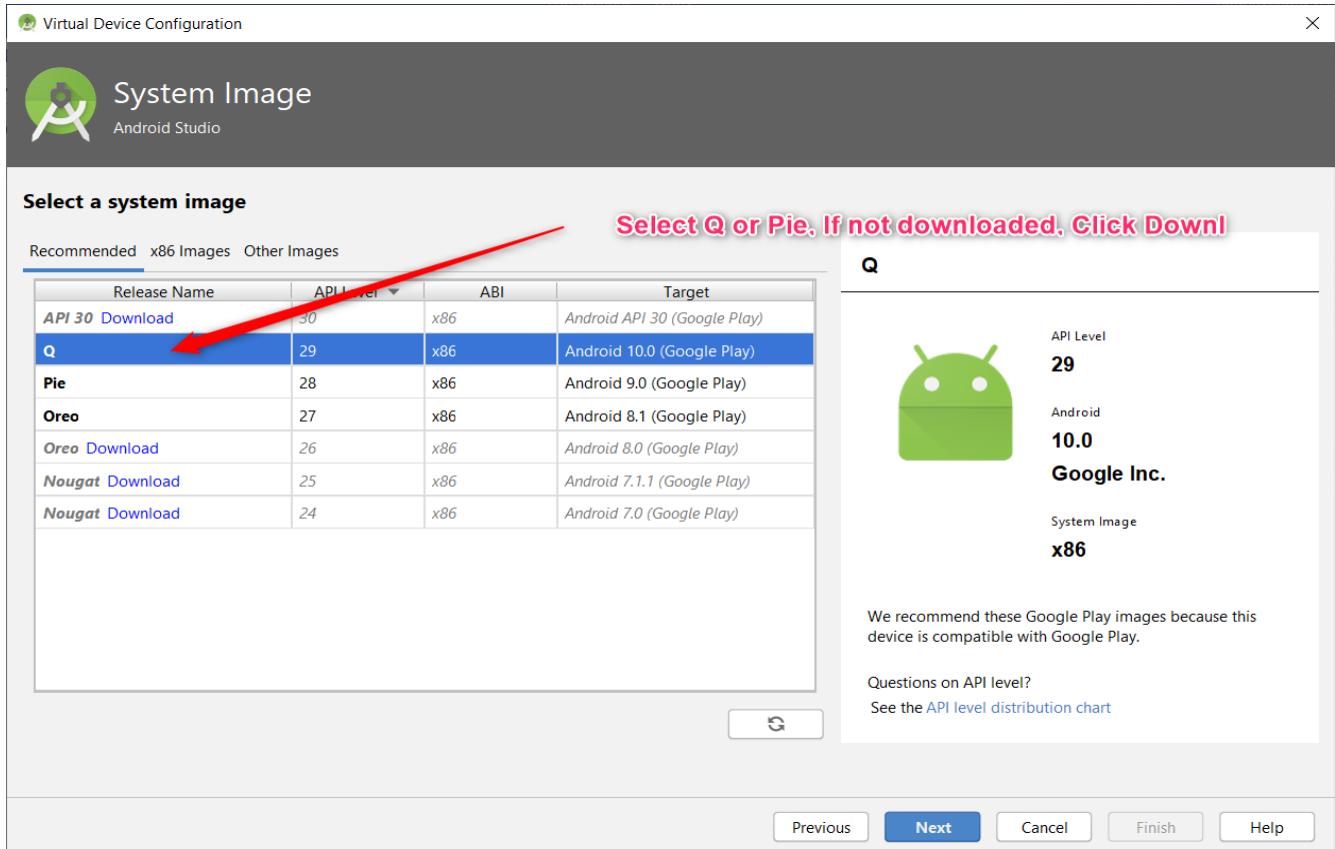




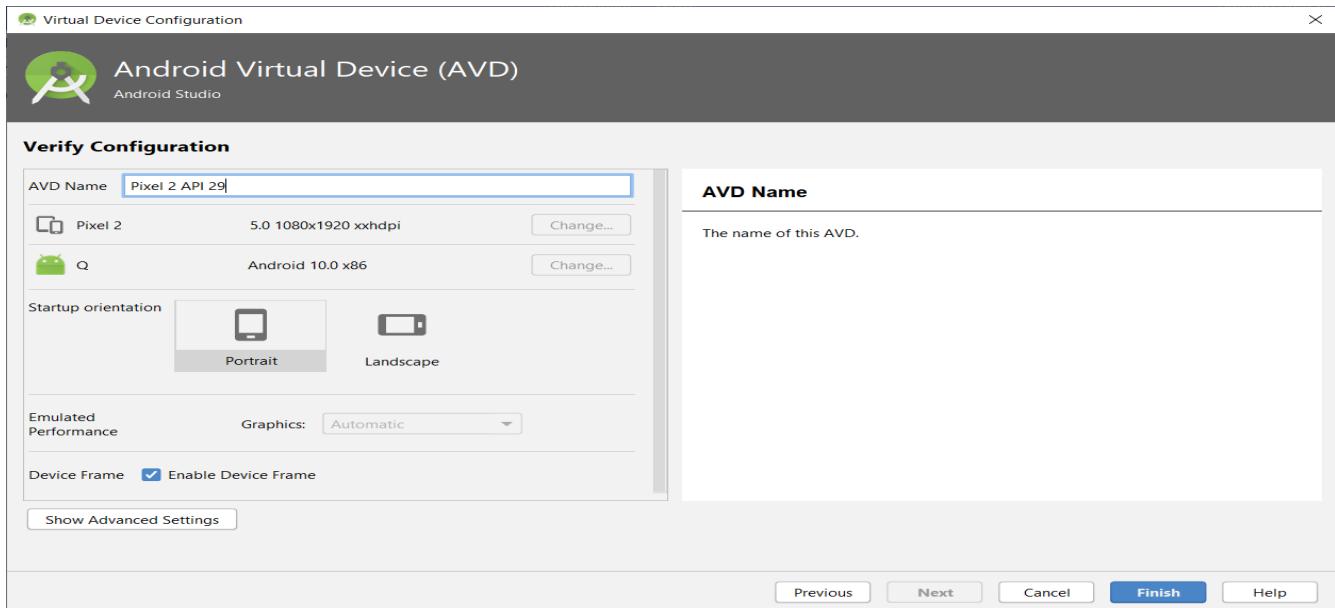
Select Create Virtual Device → Select Phone → Pixel 2 → Press Next



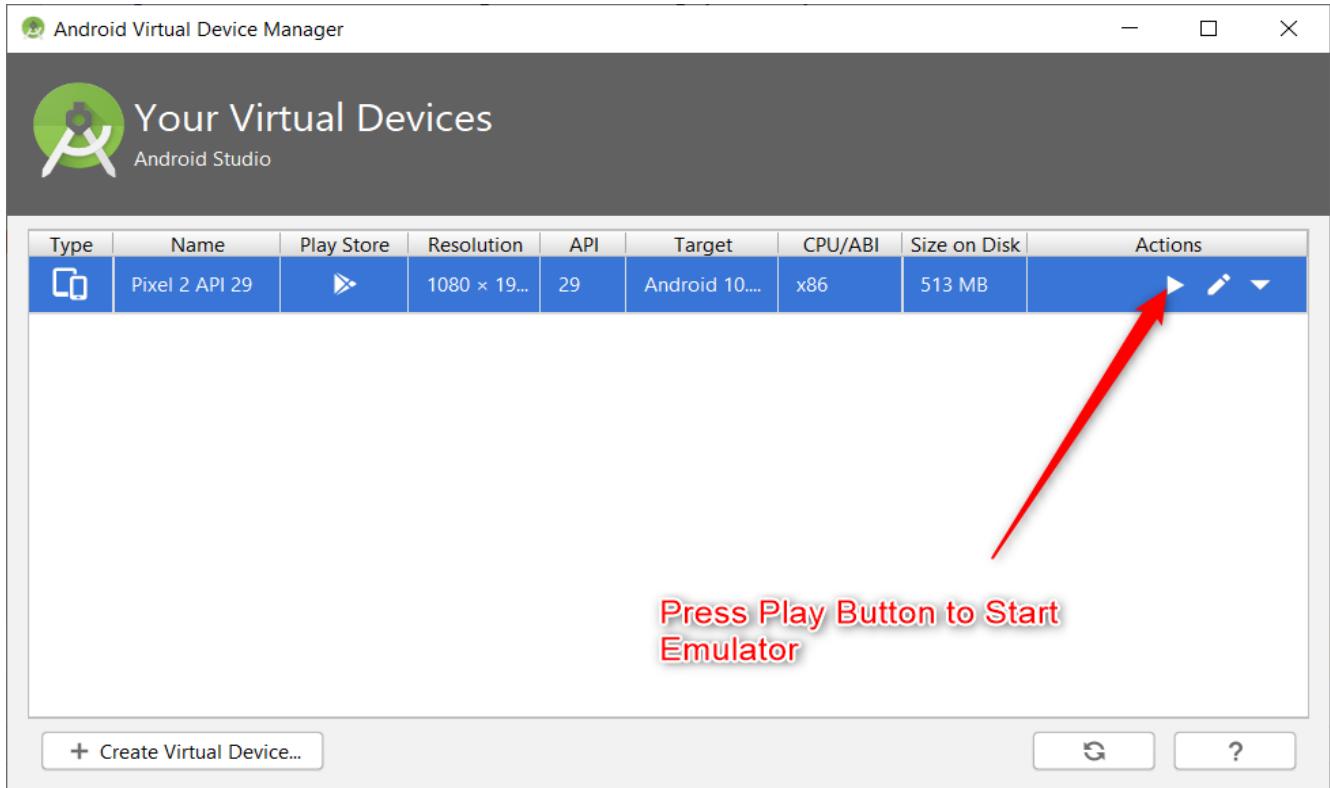
Select Android Q, if not already downloaded press download, After download completes Select Q and Press Next Button.

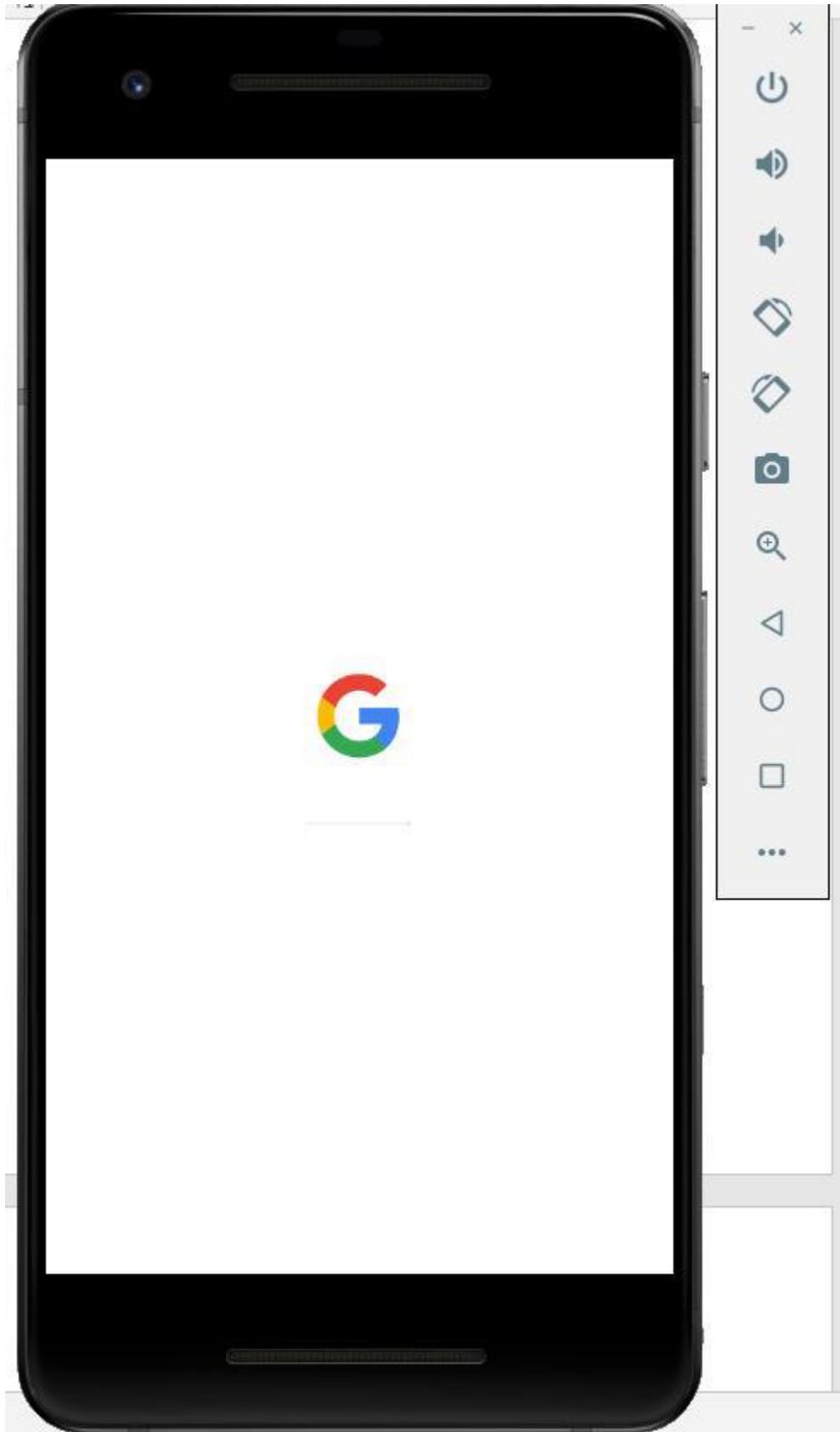


Enter AVD Name and Press Finish



Press Play Button to Start Emulator

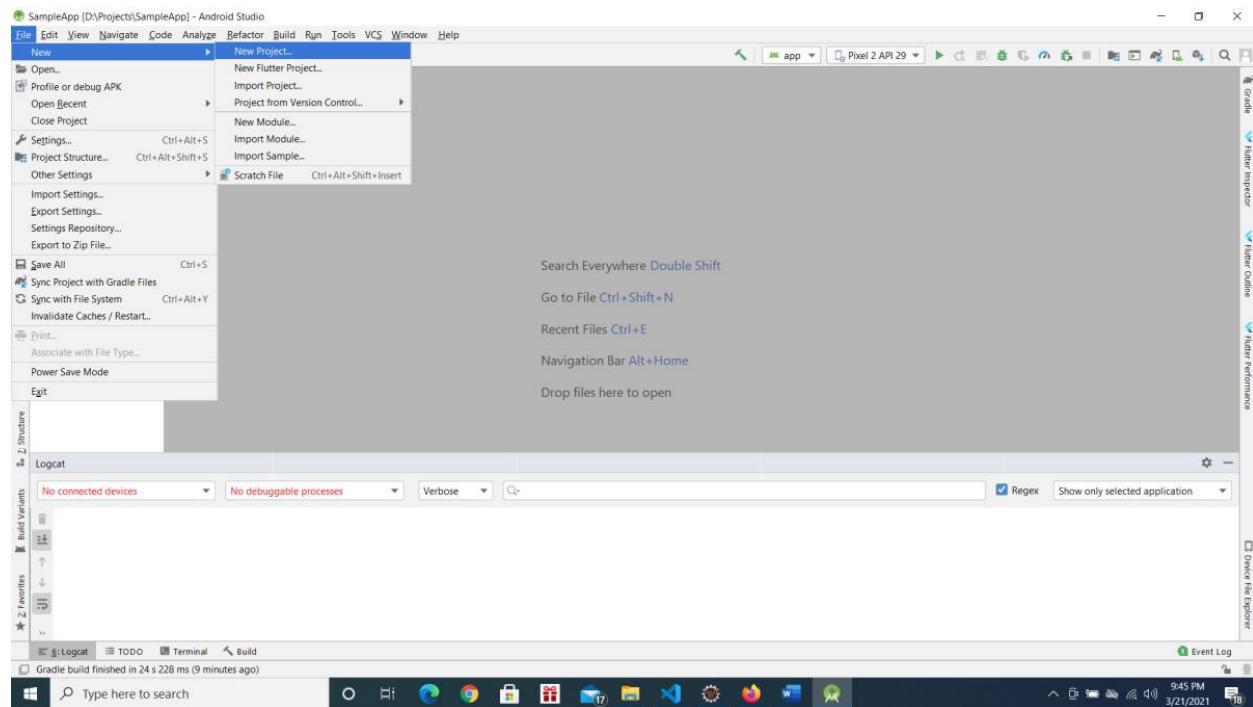




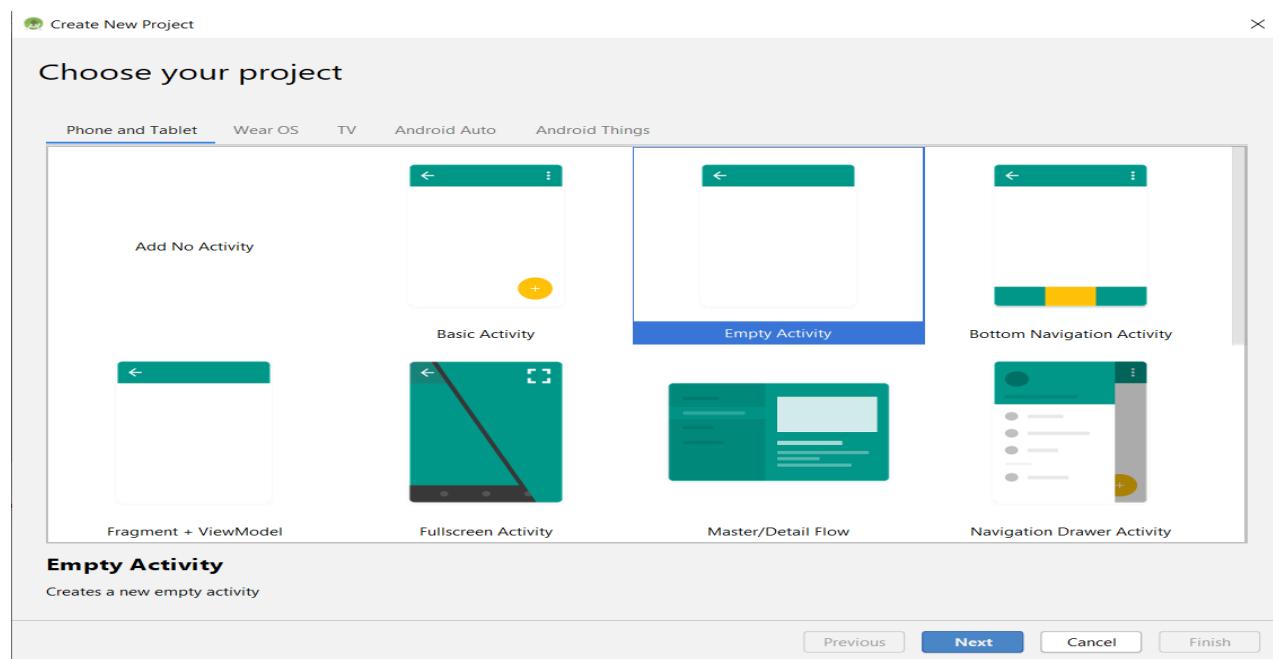
## Creating a New Project in Android

While creating a New Project for First Time, make sure Android Studio is connected to internet, It downloads the required packages from internet.

Go to File → New → New Project



Choose Phone and Tablet → Empty Activity → Press Next



In Configure your Project Screen, Enter below details and Press Finish Button.  
Enter Name of the Application → This will be application name this will be visible with Home Screen Icon.

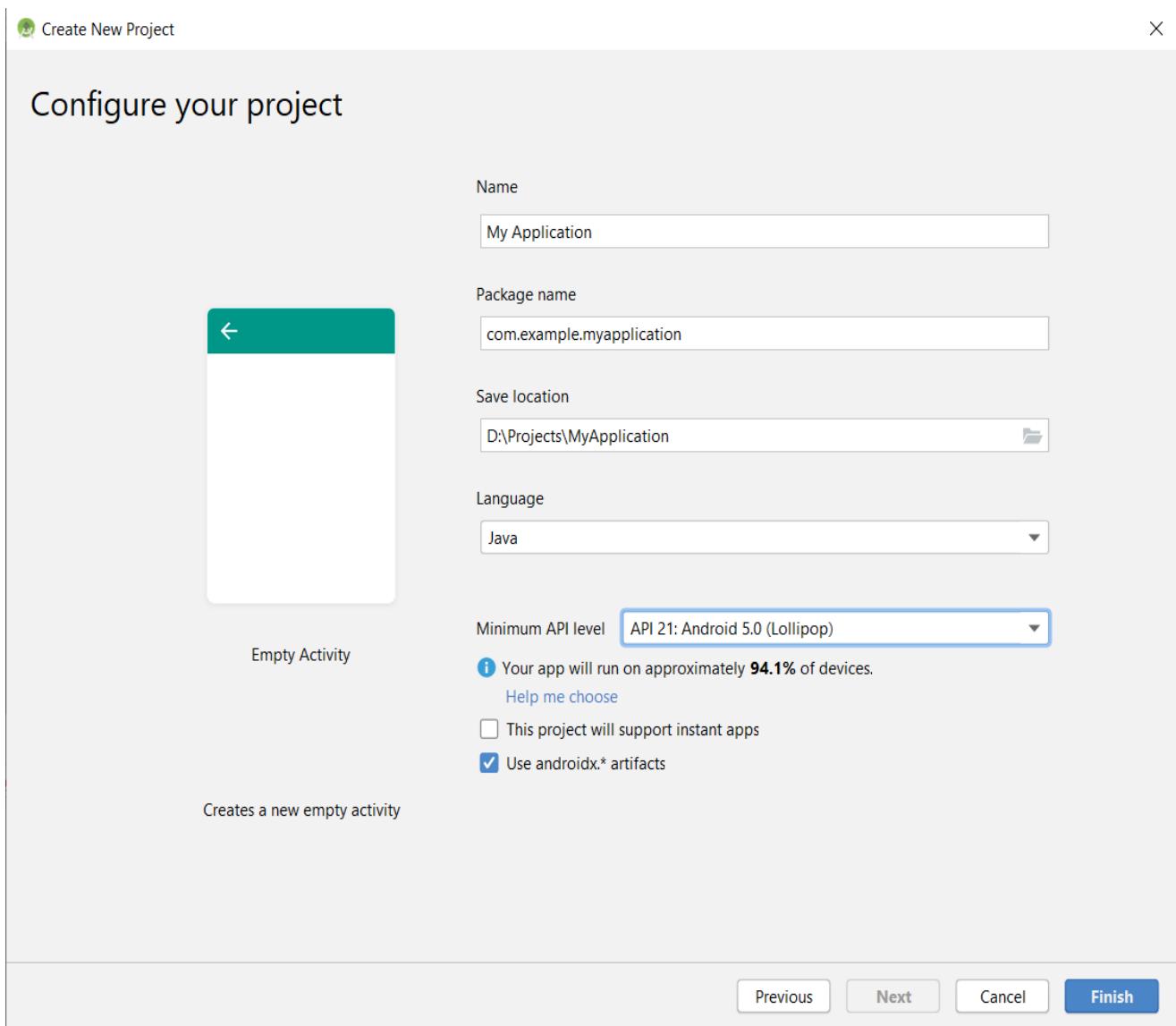
Package Name → Enter package name atleast two identifier (Eg: com.example). Best Practice is 3 or more identifier (Eg: com.example.firstapp).

Save Location → Location where to save the Project

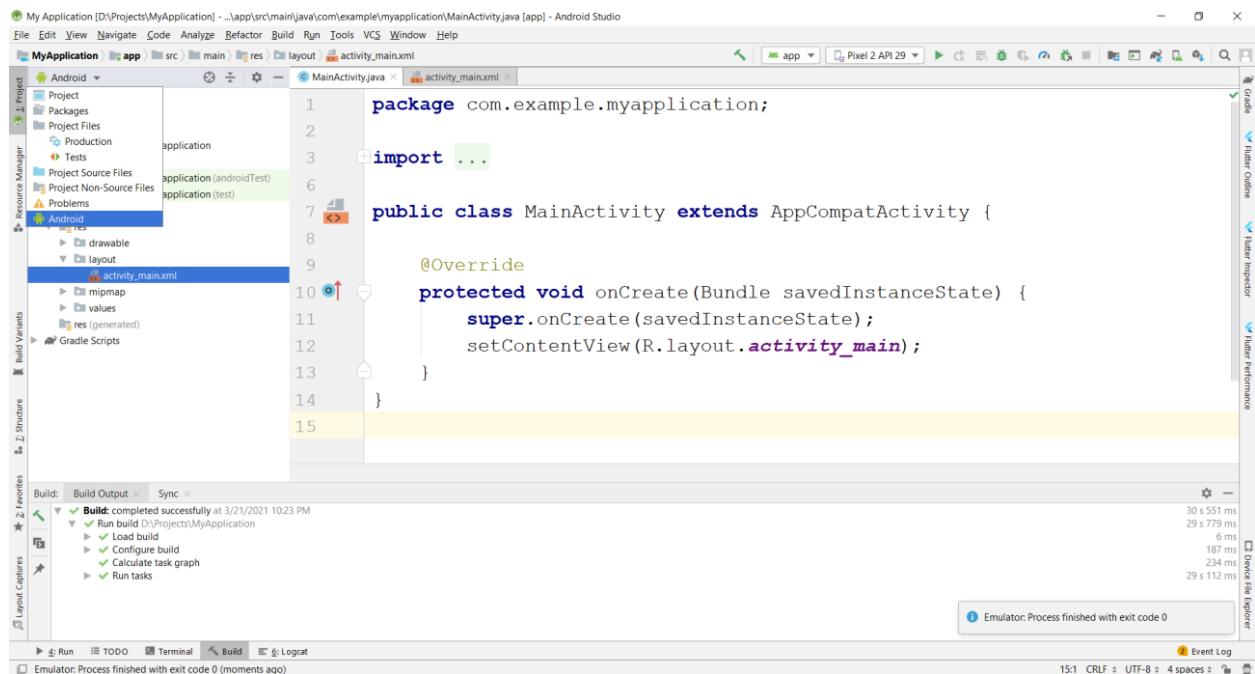
Language → Choose Java

Minimum API Level → Android 5.0

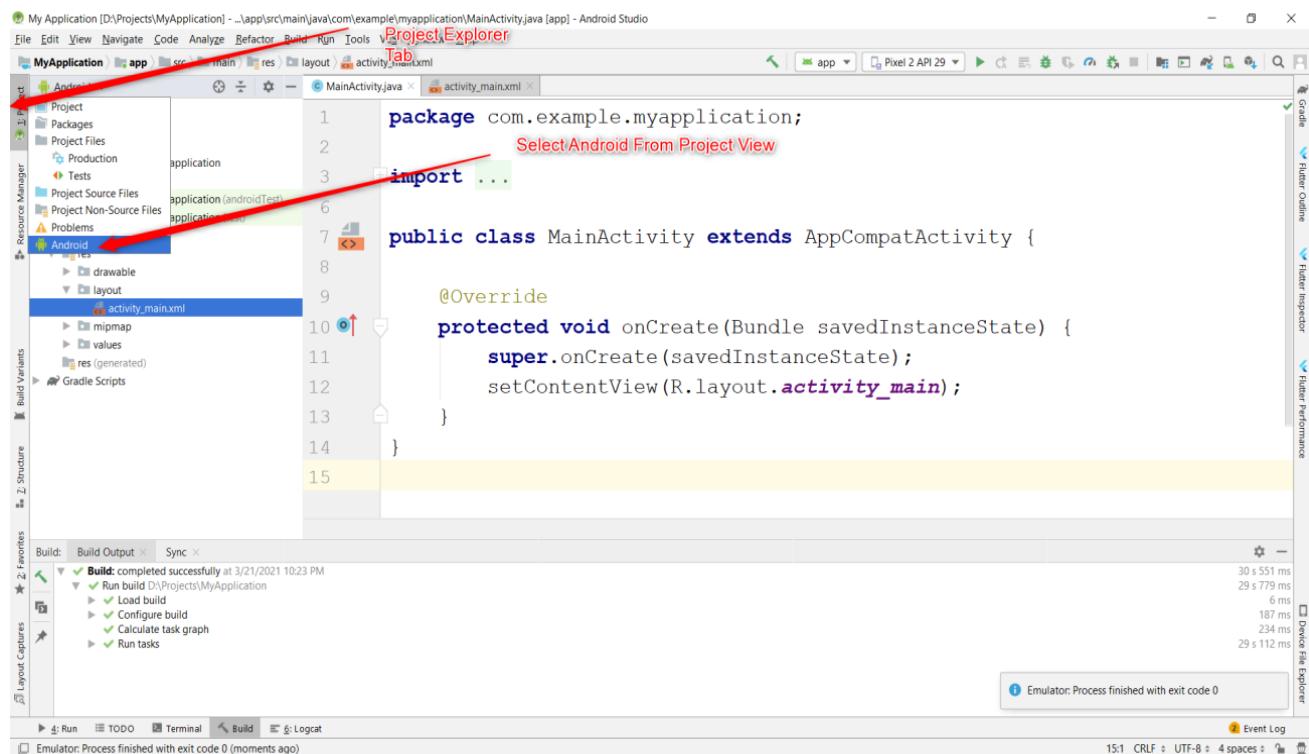
Select Checkbox Use androidx. artifacts folder as below screenshot.



## Android Project Structure:



Select Project Explorer and Select Android from Project View



## Basic View:

```

package com.example.myapplication;

import ...

public class MainActivity extends AppCompatActivity {

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

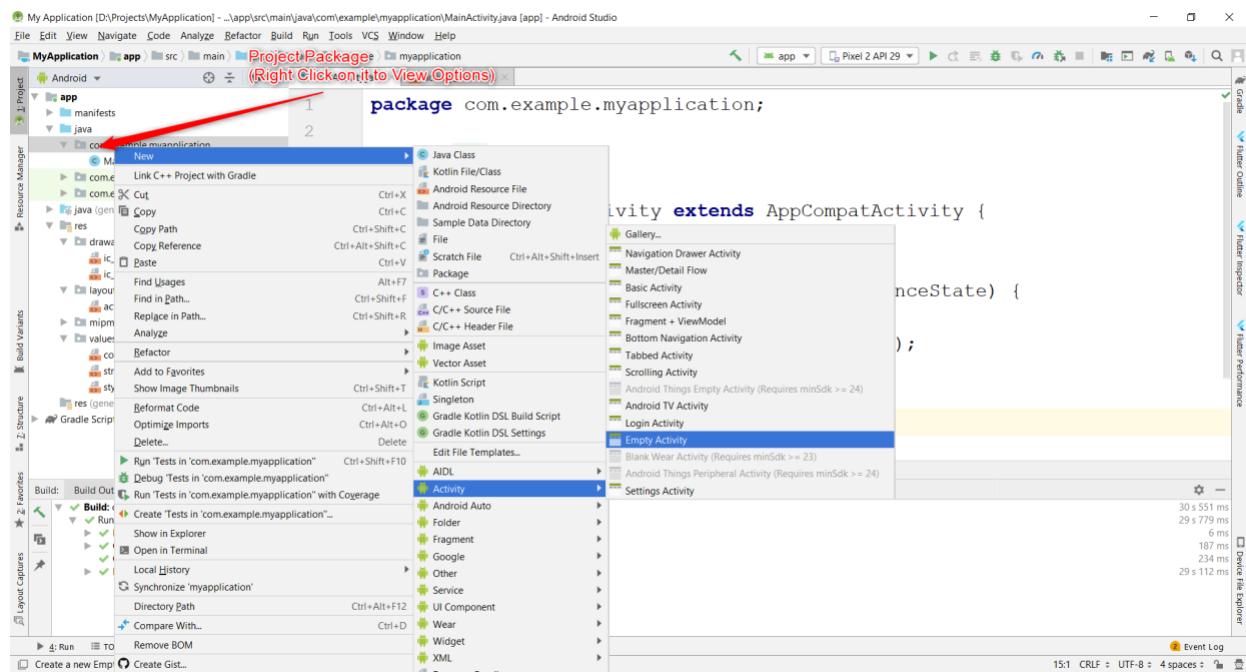
```

Build: Build completed successfully at 3/21/2021 10:23 PM

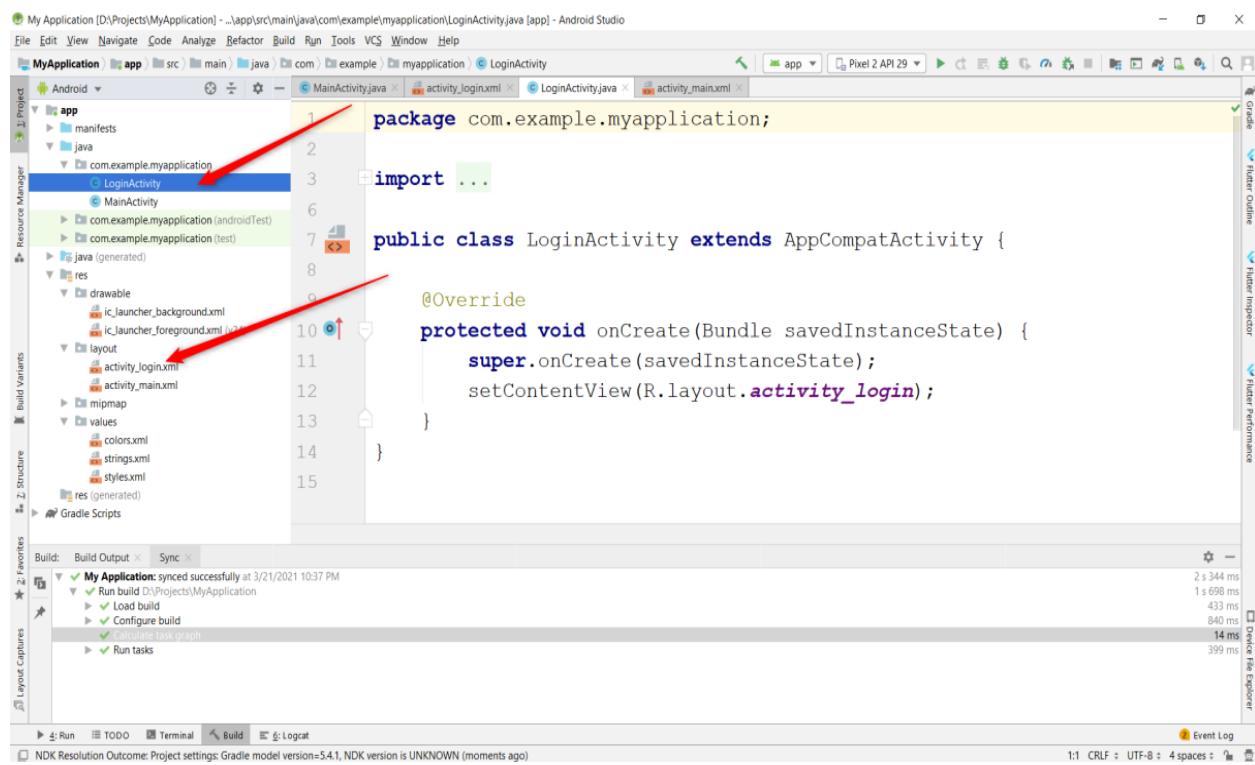
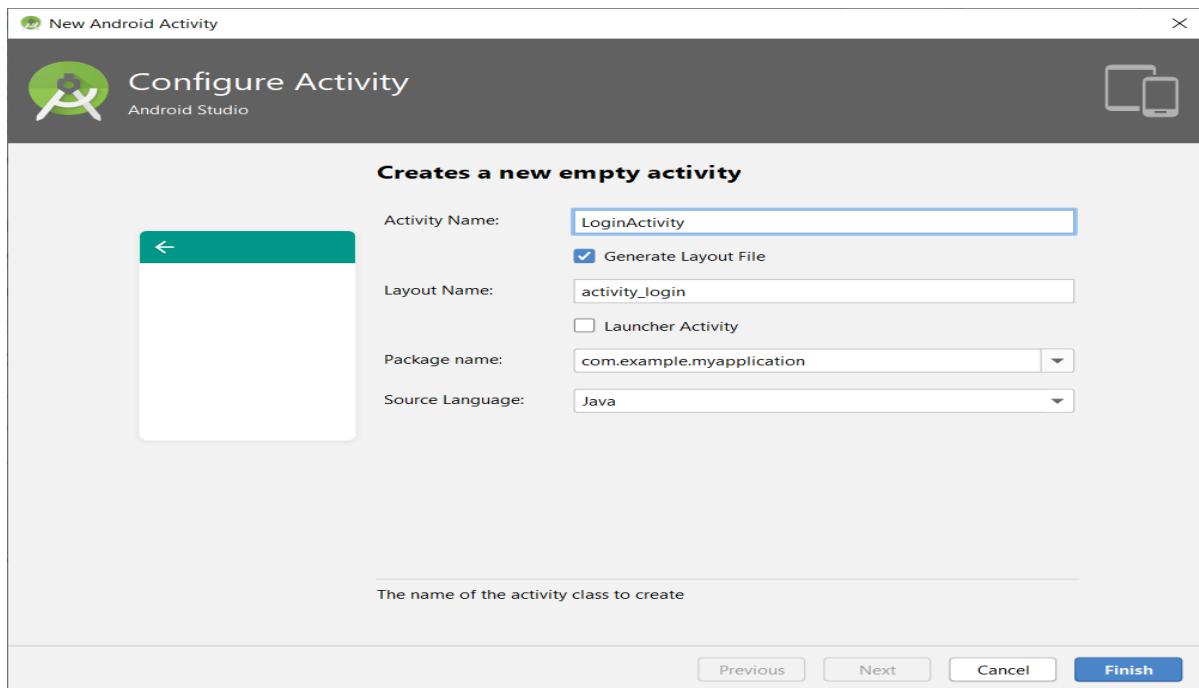
- Run build D:\Projects\MyApplication
- Load build
- Configure build
- Calculate task graph
- Run tasks

- Importing an Existing Project in Android Studio
- Creating an Activity in Android

Right Click on Package → New → Activity → Empty Activity

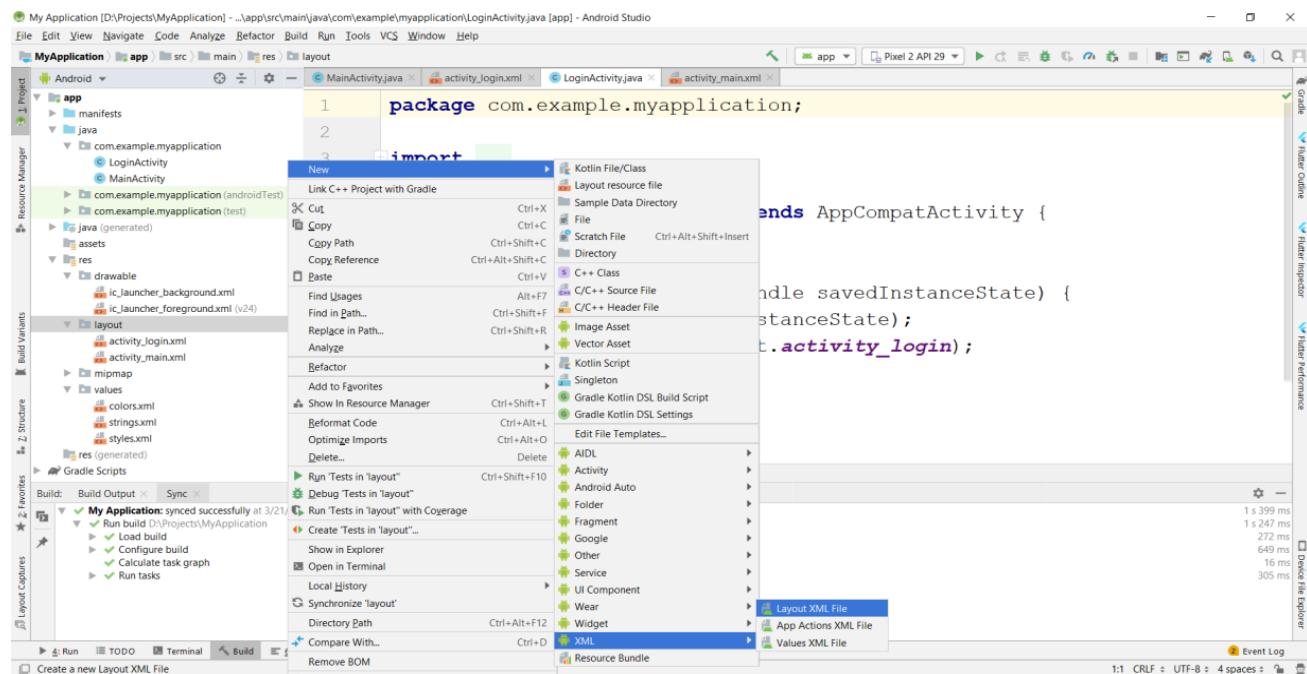


Enter Activity Name and Press Finish

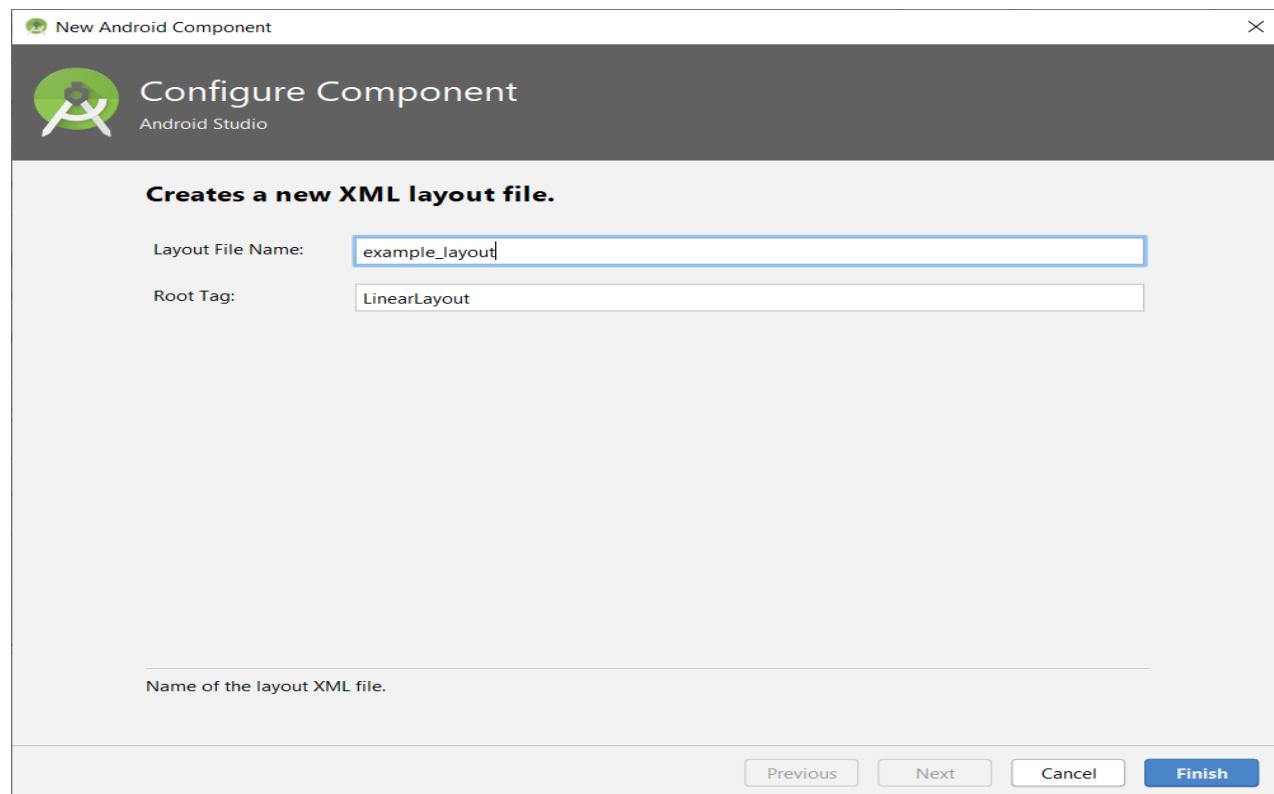


## Creating a Layout in Android

Right Click on Layout Folder → New → XML → Layout XML File

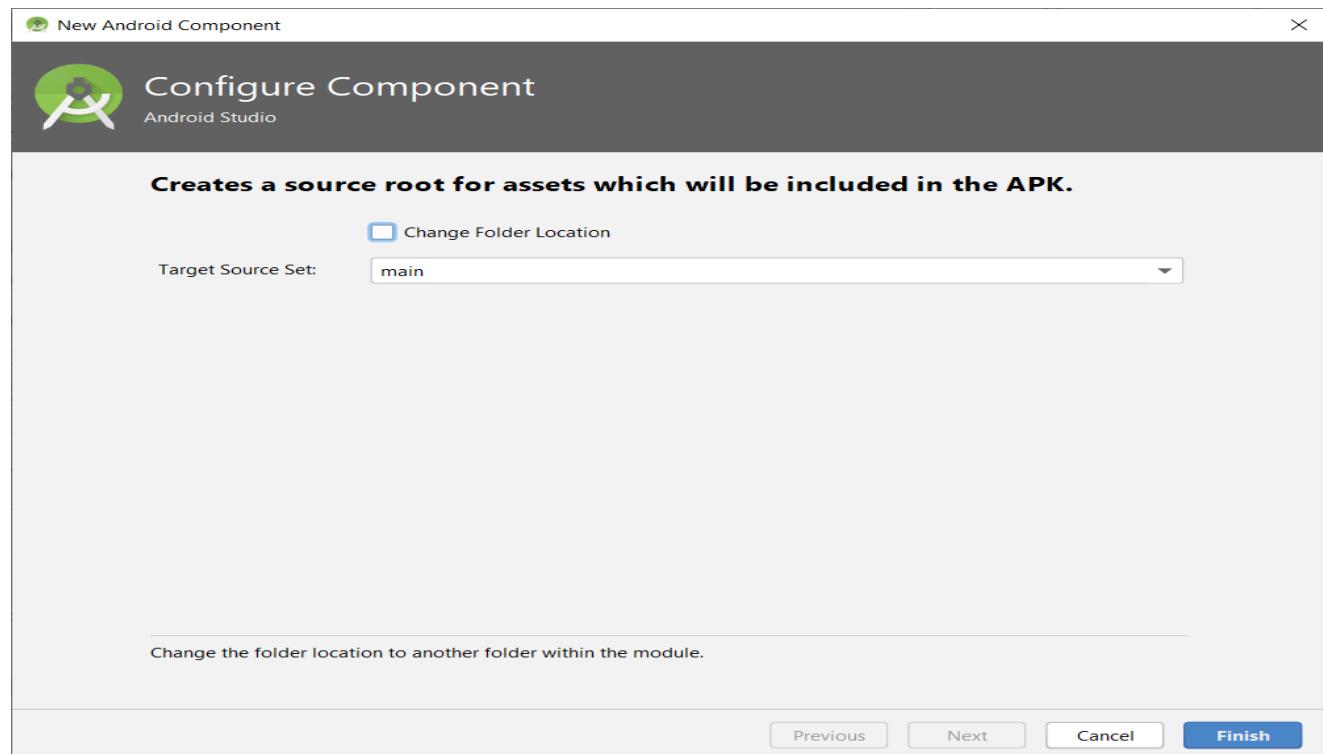
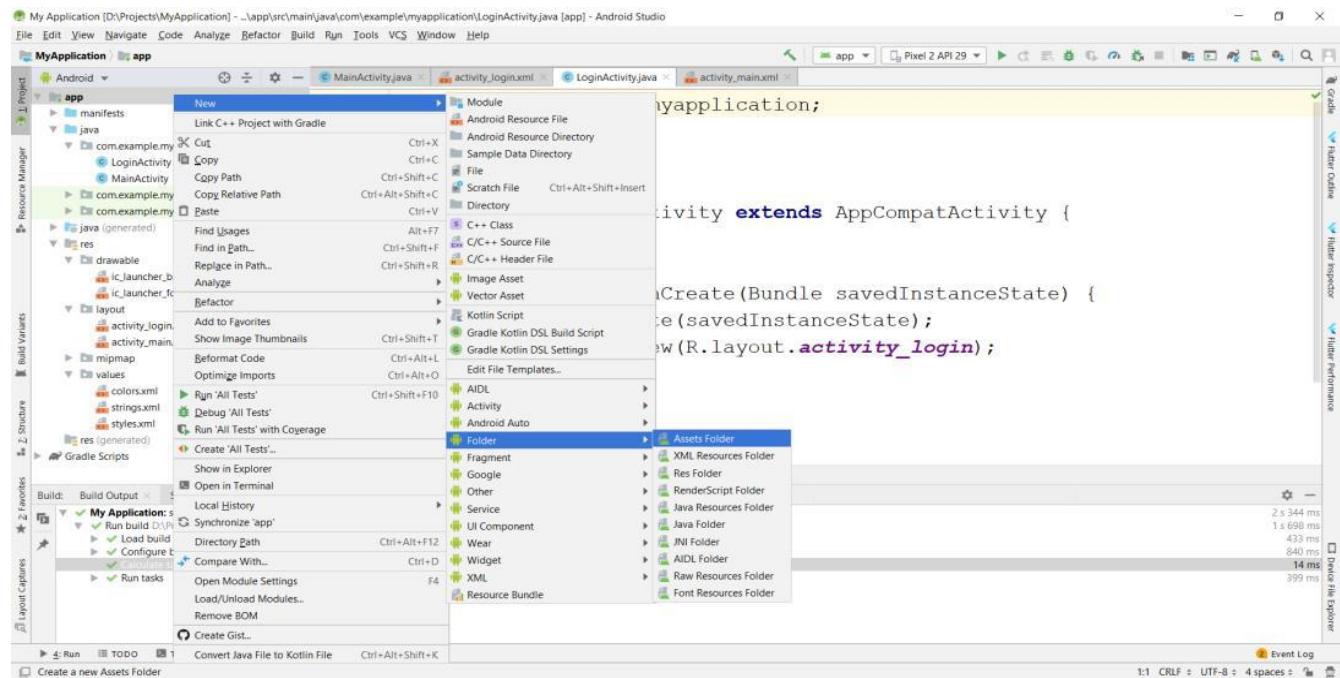


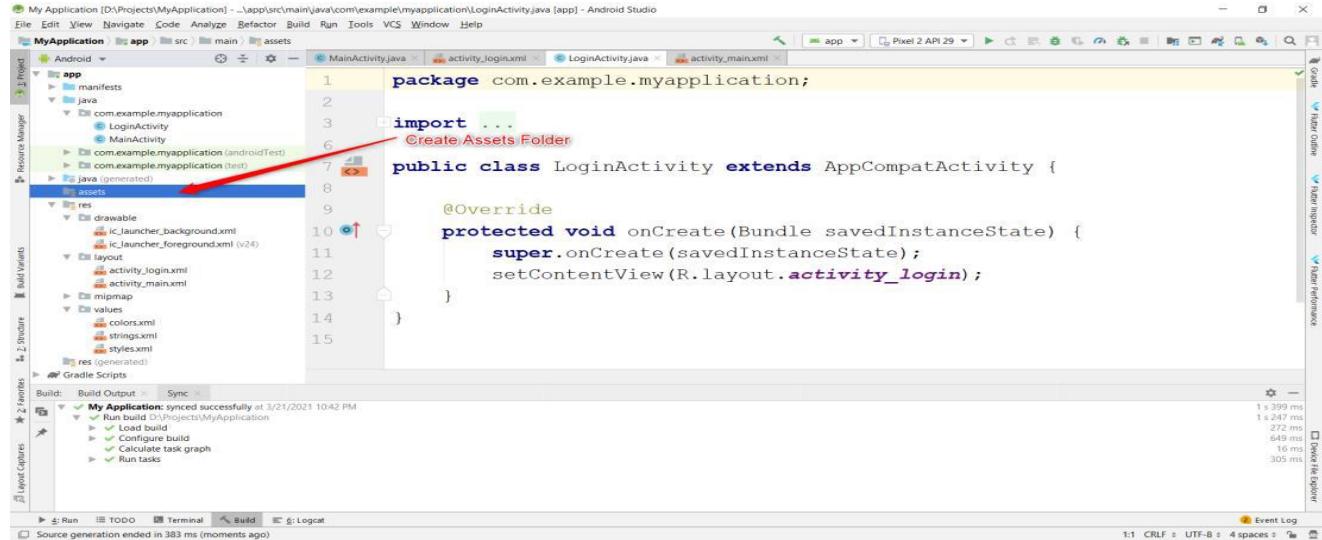
Enter xml file name and press Finish



## Creating Assets Folder in Android

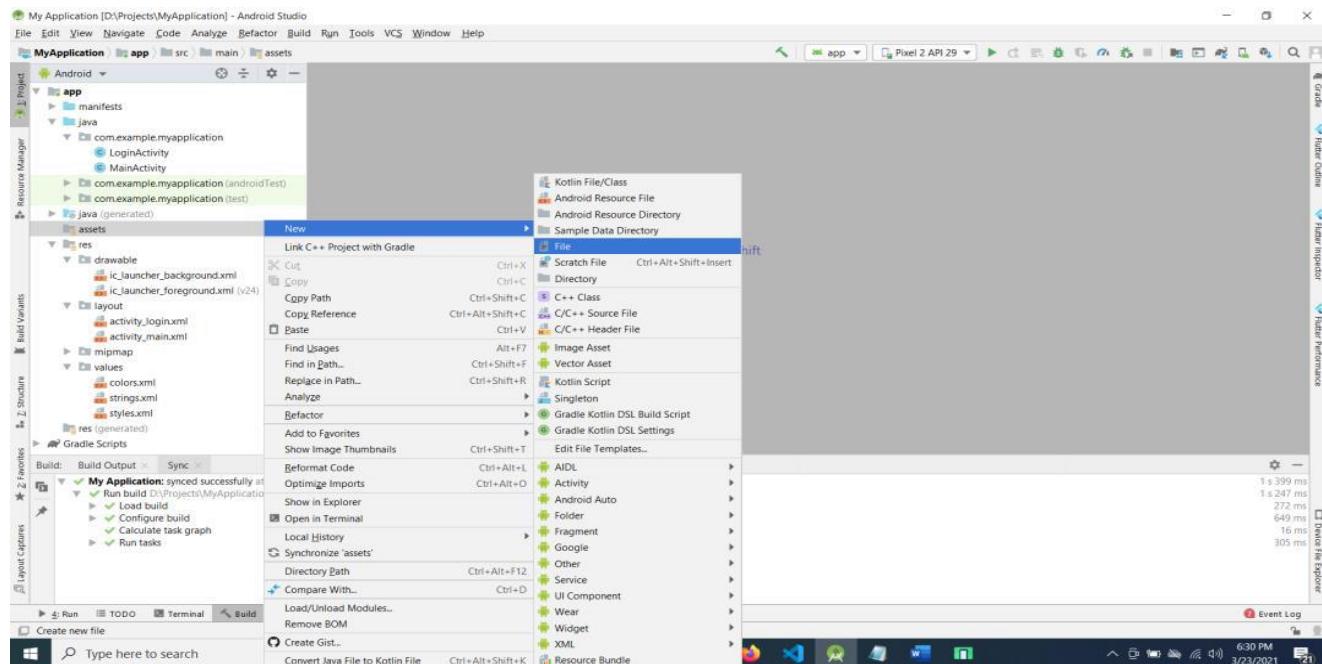
Right Click on app folder → New → Folder → Assets Folder → Press Finish Button



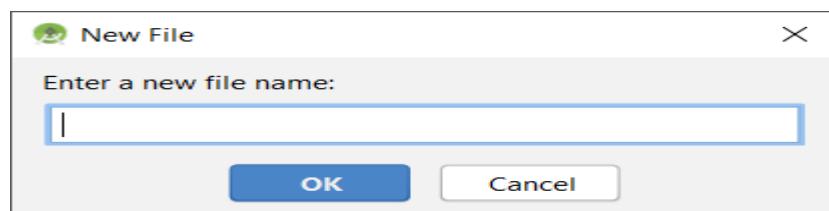


## Creating File in assets Folder:

Right Click on assets folder → New → File



Enter filename with extension (Eg: abc.xml)



**PART-A****Program 1**

Create an application to design a Visiting Card. The Visiting card should have a company logo at the top right corner. The company name should be displayed in Capital letters, aligned to the center. Information like the name of the employee, job title, phone number, address, email, fax and the website address is to be displayed. Insert a horizontal line between the job title and the phone number.



1. Create a New Android Project with Empty Activity.
2. Open activity\_main.xml file from res→layout folder, check/add Linear Layout as the root view.
3. Create layout using nested Relative Layout and TextView.
4. Use View background property to draw the line
5. Add Image to drawable folder and reference the image in the layout using @drawable/<image\_name>
6. Use android:layout\_gravity/android:gravity properties to center the components.

**Android Manifest.xml**

```
<?xml version="1.0" encoding="utf-8"?>
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
    package="com.example.visitingcard">

    <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>
```

### MainActivity.java

```
package com.example.visitingcard;

import androidx.appcompat.app.AppCompatActivity;

import android.os.Bundle;

public class MainActivity extends AppCompatActivity {

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

### activity\_main.xml

```
<?xml version="1.0" encoding="utf-8"?>

<androidx.constraintlayout.widget.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"
    android:background="#EDE9E9"
    tools:context=".MainActivity">

    <androidx.constraintlayout.widget.ConstraintLayout
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        android:elevation="10dp"
        android:background="#FFFFFF"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent">

        <TextView
```

```
    android:id="@+id/textView"
    android:layout_width="338dp"
    android:layout_height="76dp"
    android:layout_marginStart="8dp"
    android:layout_marginTop="16dp"
    android:gravity="center"
    android:text="Acranton Technologies Pvt Ltd."
    android:textSize="30dp"
    app:layout_constraintEnd_toStartOf="@+id/imageView"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toTopOf="parent" />
```

```
<View
    android:id="@+id/divider"
    android:layout_width="409dp"
    android:layout_height="1dp"
    android:layout_marginStart="8dp"
    android:layout_marginTop="32dp"
    android:layout_marginEnd="8dp"
    android:background="?android:attr/listDivider"
    android:elevation="6dp"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toBottomOf="@+id/imageView" />
```

```
<ImageView
    android:id="@+id/imageView"
    android:layout_width="66dp"
    android:layout_height="75dp"
    android:layout_marginTop="16dp"
    android:layout_marginEnd="4dp"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintTop_toTopOf="parent"
    app:srcCompat="@drawable/atlogo" />
```

```
<TextView
    android:id="@+id/textView2"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginTop="8dp"
    android:text="Acranton"
    android:textColor="#000000"
    android:textSize="16dp"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toBottomOf="@+id/divider" />
```

```
<TextView
    android:id="@+id/textView3"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginTop="24dp"
    android:text="Trainer"
    android:textColor="#000000"
    app:layout_constraintEnd_toEndOf="@+id/textView2"
    app:layout_constraintStart_toStartOf="@+id/textView2"
    app:layout_constraintTop_toBottomOf="@+id/textView2" />

<TextView
    android:id="@+id/textView4"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginTop="16dp"
    android:text="0987654321"
    android:textColor="#000000"
    app:layout_constraintEnd_toEndOf="@+id/textView3"
    app:layout_constraintStart_toStartOf="@+id/textView3"
    app:layout_constraintTop_toBottomOf="@+id/textView3" />

<TextView
    android:id="@+id/textView5"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginTop="16dp"
    android:text="ChickkaBanavara, Bangalore"
    android:textColor="#000000"
    app:layout_constraintEnd_toEndOf="@+id/textView4"
    app:layout_constraintStart_toStartOf="@+id/textView4"
    app:layout_constraintTop_toBottomOf="@+id/textView4" />

<TextView
    android:id="@+id/textView6"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginTop="16dp"
    android:layout_marginBottom="24dp"
    android:text="AcrantonTechnologies@gmail.com"
    android:textColor="#000000"
    app:layout_constraintBottom_toBottomOf="parent"
    app:layout_constraintEnd_toEndOf="@+id/textView5"
    app:layout_constraintStart_toStartOf="@+id/textView5"
    app:layout_constraintTop_toBottomOf="@+id/textView5" />
```

```
</androidx.constraintlayout.widget.ConstraintLayout>
</androidx.constraintlayout.widget.ConstraintLayout>
```

### Sample Output

**NOTE: Add Logo in drawable folder**

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## Acharya Institute of Technology



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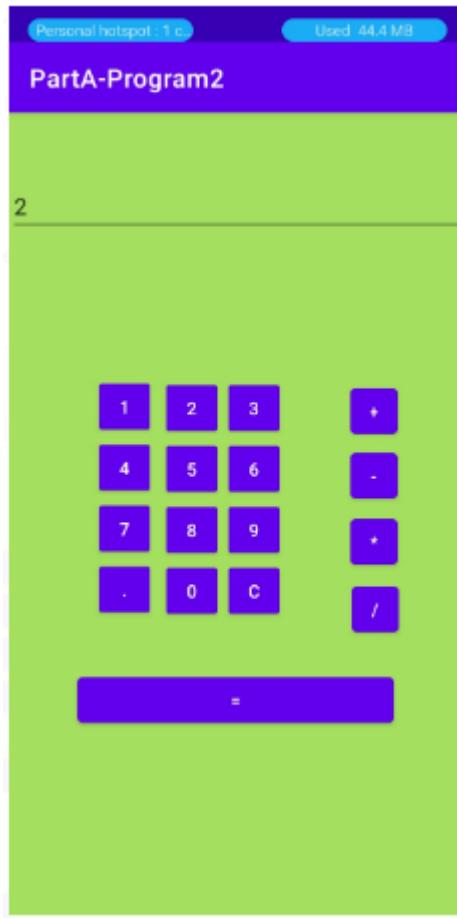
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### Program 2:

**Develop an Android application using controls like Button, TextView, EditText for designing a Calculator having basic functionality like Addition, Subtraction, Multiplication, and Division.**

1. Create a New Android Project with Empty Activity.
2. Open activity\_main.xml file from res→layout folder, check/add Constraint Layout as the root view.
3. Create Layout using Drag and Drop framework.
4. Open MainActivity.java file, Override onCreate() method and bring activity\_main.xml file on screen  
Using setContentView () and bring the view references using findViewById() method.
5. Add Listeners to Button Click Event:
6. Create a class which implements OnClickListener interface.
7. Override onClick() method of OnClickListener Interface.
8. Register the button for click event by calling setOnClickListener () method of View class and pass the object of the class that implemented OnClickListener Interface.
9. Create a logic to Add/Subtract/Multiply/Divide to perform arithmetic operation on 2 operands (Eg: 10+20), If more than 2 operands or wrong input, display invalid input messages.

## Design



## AndroidManifest.xml

```
<?xml version="1.0" encoding="utf-8"?>
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
    package="com.acranton.simplecalculator">

    <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>
</application>

</manifest>
```

### MainActivity.java

```
package com.acranton.simplecalculator;

import androidx.appcompat.app.AppCompatActivity;

import android.os.Bundle;
import android.view.View;
import android.widget.Button;
import android.widget.EditText;

public class MainActivity extends AppCompatActivity {

    Button button0 , button1 , button2 , button3 , button4 , button5 , button6 ,
        button7 , button8 , button9 , buttonAdd , buttonSub , buttonDivision ,
        buttonMul , button10 , buttonC , buttonEqual ;

    EditText edt1 ;

    float mValueOne , mValueTwo ;

    boolean mAddition , mSubtract ,mMultiplication ,mDivision ;

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

        button0 = (Button) findViewById(R.id.button0);
        button1 = (Button) findViewById(R.id.button1);
        button2 = (Button) findViewById(R.id.button2);
        button3 = (Button) findViewById(R.id.button3);
        button4 = (Button) findViewById(R.id.button4);
        button5 = (Button) findViewById(R.id.button5);
        button6 = (Button) findViewById(R.id.button6);
        button7 = (Button) findViewById(R.id.button7);
        button8 = (Button) findViewById(R.id.button8);
        button9 = (Button) findViewById(R.id.button9);
        button10 = (Button) findViewById(R.id.button10);
        buttonAdd = (Button) findViewById(R.id.buttonadd);
        buttonSub = (Button) findViewById(R.id.buttonsub);
```

```
buttonMul = (Button) findViewById(R.id.buttonmul);
buttonDivision = (Button) findViewById(R.id.buttondiv);
buttonC = (Button) findViewById(R.id.buttonC);
buttonEqual = (Button) findViewById(R.id.buttoneql);

edt1 = (EditText) findViewById(R.id.edt1);

button1.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {

        edt1.setText(edt1.getText()+"1");
    }
});

button2.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        edt1.setText(edt1.getText()+"2");
    }
});

button3.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        edt1.setText(edt1.getText()+"3");
    }
});

button4.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        edt1.setText(edt1.getText()+"4");
    }
});

button5.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        edt1.setText(edt1.getText()+"5");
    }
});

button6.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        edt1.setText(edt1.getText()+"6");
    }
});

button7.setOnClickListener(new View.OnClickListener() {
    @Override
```

```
public void onClick(View v) {
    edt1.setText(edt1.getText()+"7");
}
});
button8.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        edt1.setText(edt1.getText()+"8");
    }
});
button9.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        edt1.setText(edt1.getText()+"9");
    }
});
button0.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        edt1.setText(edt1.getText()+"0");
    }
});
buttonAdd.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        if(edt1 == null){
            edt1.setText("");
        }else {
            mValueOne = Float.parseFloat(edt1.getText() + "");
            mAddition = true;
            edt1.setText(null);
        }
    }
});
buttonSub.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        mValueOne = Float.parseFloat(edt1.getText() + "");
        mSubtract = true ;
        edt1.setText(null);
    }
});
buttonMul.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        mValueOne = Float.parseFloat(edt1.getText() + "");
```

```
        mMultiplication = true ;
        edt1.setText(null);
    }
});
buttonDivision.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        mValueOne = Float.parseFloat(edt1.getText().toString());
        mDivision = true ;
        edt1.setText(null);
    }
});

buttonEqual.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {

        mValueTwo = Float.parseFloat(edt1.getText().toString());

        if (mAddition == true){
            edt1.setText(mValueOne + mValueTwo + "");
            mAddition=false;
        }
        if (mSubtract == true){
            edt1.setText(mValueOne - mValueTwo+"");
            mSubtract=false;
        }
        if (mMultiplication == true){
            edt1.setText(mValueOne * mValueTwo+"");
            mMultiplication=false;
        }
        if (mDivision == true){
            edt1.setText(mValueOne / mValueTwo+"");
            mDivision=false;
        }
    }
});
buttonC.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        edt1.setText("");
    }
});
button10.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
```

```
        edt1.setText(edt1.getText()+".");
    }
});
}
}
```

### activity\_main.xml

```
<?xml version="1.0" encoding="utf-8"?>
<RelativeLayout xmlns:android="http://schemas.android.com/apk/res/android"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:background="#A4DF60">

    <EditText
        android:id="@+id/edt1"
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        android:layout_alignParentTop="true"
        android:layout_marginTop="51dp"
        android:ems="10" />

    <Button
        android:id="@+id/button1"
        style="?android:attr/buttonStyleSmall"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_below="@+id/edt1"
        android:layout_alignParentStart="true"
        android:layout_marginStart="67dp"
        android:layout_marginTop="111dp"
        android:text="1" />

    <Button
        android:id="@+id/button2"
        style="?android:attr/buttonStyleSmall"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_alignStart="@+id/button1"
        android:layout_alignTop="@+id/button1"
        android:layout_marginStart="53dp"
        android:layout_marginTop="1dp"
        android:text="2" />

    <Button
        android:id="@+id/button3"
```

```
style="?android:attr/buttonStyleSmall"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_alignLeft="@+id/button2"
    android:layout_alignTop="@+id/button2"
    android:layout_marginLeft="49dp"
    android:layout_marginTop="0dp"
    android:text="3" />
```

```
<Button
    android:id="@+id/button4"
    style="?android:attr/buttonStyleSmall"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_below="@+id/button1"
    android:layout_alignLeft="@+id/button1"
    android:text="4" />
```

```
<Button
    android:id="@+id/button5"
    style="?android:attr/buttonStyleSmall"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_below="@+id/button2"
    android:layout_alignLeft="@+id/button2"
    android:text="5" />
```

```
<Button
    android:id="@+id/button6"
    style="?android:attr/buttonStyleSmall"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_below="@+id/button3"
    android:layout_alignLeft="@+id/button3"
    android:text="6" />
```

```
<Button
    android:id="@+id/button7"
    style="?android:attr/buttonStyleSmall"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_below="@+id/button4"
    android:layout_alignLeft="@+id/button4"
    android:text="7" />
```

```
<Button
```

```
    android:id="@+id/button8"
    style="?android:attr/buttonStyleSmall"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_below="@id/button5"
    android:layout_alignLeft="@id/button5"
    android:text="8" />
```

```
<Button
    android:id="@+id/button9"
    style="?android:attr/buttonStyleSmall"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_below="@id/button6"
    android:layout_alignLeft="@id/button6"
    android:text="9" />
```

```
<Button
    android:id="@+id/button10"
    style="?android:attr/buttonStyleSmall"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_below="@id/button7"
    android:layout_alignLeft="@id/button7"
    android:text"." />
```

```
<Button
    android:id="@+id/button0"
    style="?android:attr/buttonStyleSmall"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_below="@id/button8"
    android:layout_alignLeft="@id/button8"
    android:text="0" />
```

```
<Button
    android:id="@+id/buttonC"
    style="?android:attr/buttonStyleSmall"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_below="@id/button9"
    android:layout_alignLeft="@id/button9"
    android:text="C" />
```

```
<Button
    android:id="@+id/buttonadd"
```

```
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_alignParentTop="true"
    android:layout_alignParentEnd="true"
    android:layout_marginStart="52dp"
    android:layout_marginLeft="52dp"
    android:layout_marginTop="211dp"
    android:layout_marginEnd="54dp"
    android:layout_toEndOf="@+id/button3"
    android:layout_toRightOf="@+id/button3"
    android:text="+" />
```

```
<Button
    android:id="@+id/buttonsub"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_below="@+id/buttonadd"
    android:layout_alignParentEnd="true"
    android:layout_marginStart="52dp"
    android:layout_marginLeft="52dp"
    android:layout_marginTop="3dp"
    android:layout_marginEnd="54dp"
    android:layout_toRightOf="@+id/button6"
    android:layout_toEndOf="@+id/button6"
    android:text="-" />
```

```
<Button
    android:id="@+id/buttonmul"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_below="@+id/buttonsub"
    android:layout_alignParentEnd="true"
    android:layout_marginStart="52dp"
    android:layout_marginLeft="54dp"
    android:layout_marginTop="4dp"
    android:layout_marginEnd="54dp"
    android:layout_toEndOf="@+id/button9"
    android:layout_toRightOf="@+id/button9"
    android:text="*" />
```

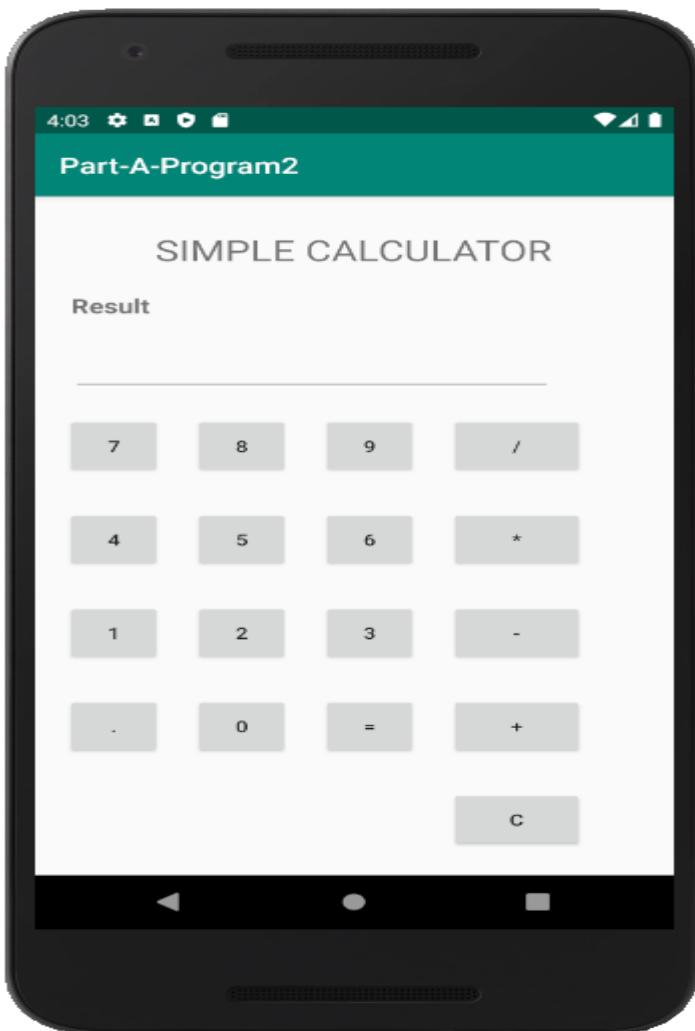
```
<Button
    android:id="@+id/buttondiv"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_below="@+id/buttonmul"
    android:layout_alignParentEnd="true"
```

```
    android:layout_marginStart="53dp"
    android:layout_marginLeft="53dp"
    android:layout_marginTop="5dp"
    android:layout_marginEnd="53dp"
    android:layout_toEndOf="@+id/buttonC"
    android:layout_toRightOf="@+id/buttonC"
    android:text="/" />

<Button
    android:id="@+id/buttoneql"
    android:layout_width="300dp"
    android:layout_height="wrap_content"
    android:layout_below="@+id/button0"
    android:layout_alignParentStart="true"
    android:layout_alignParentEnd="true"
    android:layout_marginStart="54dp"
    android:layout_marginTop="38dp"
    android:layout_marginEnd="57dp"
    android:text="=" />

</RelativeLayout>
```

### Sample Output



**Program 3:**

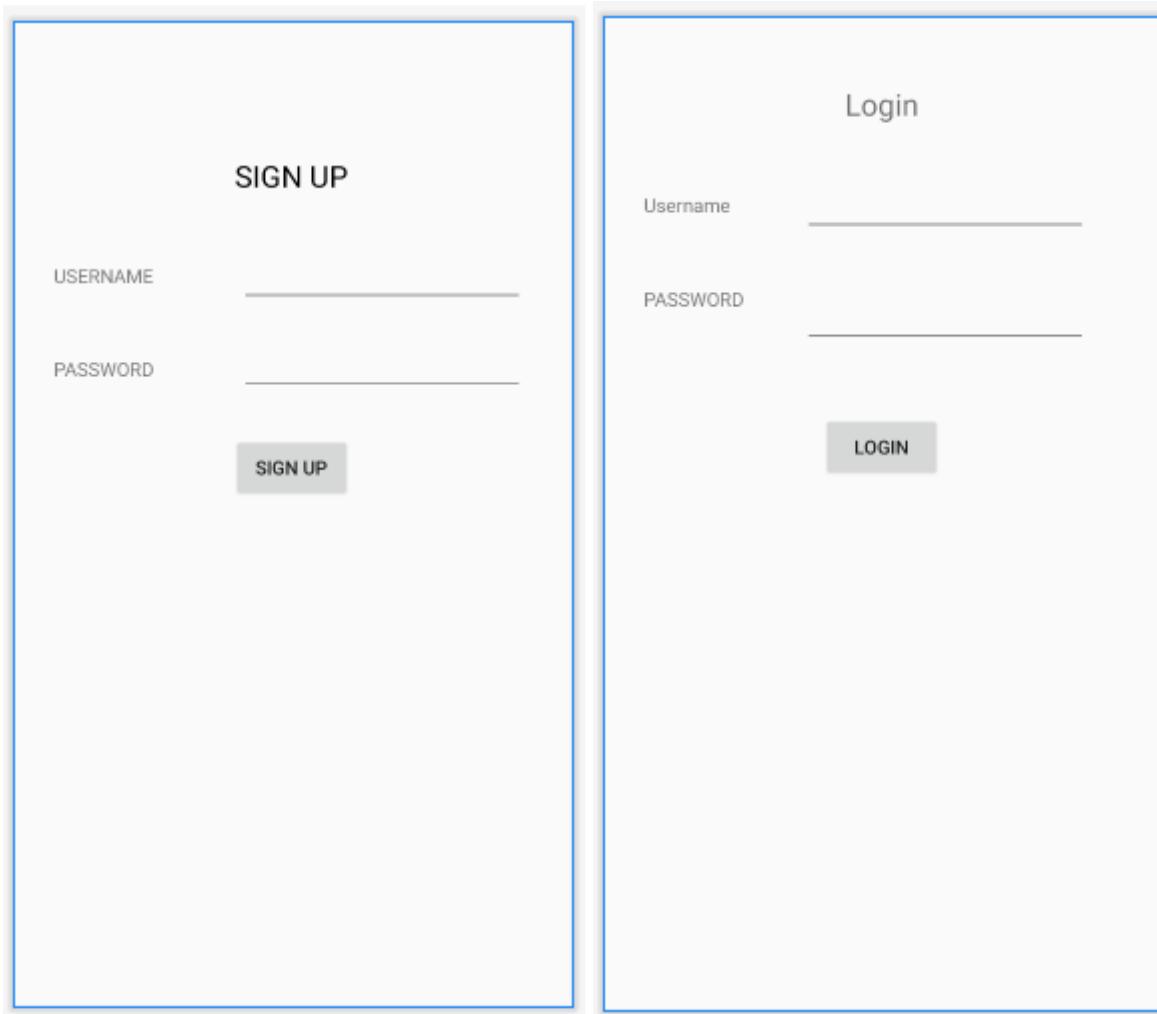
**Create a SIGN Up activity with Username and Password. Validation of password should happen based on the following rules:**

- Password should contain uppercase and lowercase letters.
- Password should contain letters and numbers.
- Password should contain special characters.
- Minimum length of the password (the default value is 8).

On successful **SIGN UP** proceed to the next Login activity. Here the user should **SIGN IN** using the Username and Password created during signup activity. If the Username and Password are matched then navigate to the next activity which displays a message saying “Successful Login” or else display a toast message saying “Login Failed”. The user is given only two attempts and after that display a toast message saying “Failed Login Attempts” and disable the **SIGN IN** button. Use Bundle to transfer information from one activity to another.

1. Create a New Android Project with Empty Activity.
2. Open activity\_main.xml file from res→layout folder, check/add Constraint Layout as the root view.
3. Create Signup Layout using Drag and Drop framework design the layout.
4. Create One more Empty Activity LoginActivity using Android Studio Create Activity Flow (Refer Android Studio Tutorial)
5. Open activity\_login.xml file from res→layout folder, check/add Constraint Layout as the root view.
6. Create Login Layout using Drag and Drop framework.
7. Add Listeners to Button Click Event:
  - Create a class which implements OnClickListener interface.
  - Override onClick () method of OnClickListener Interface.
  - Register the button for click event by calling setOnClickListener () method of View class and pass the object of the class that implemented OnClickListener Interface.
8. Use Regular Expression "`^(?=.*[A-Z])(?=.*[a-z])(?=.*\d)(?=.*[@$!])[A-Za-z\d@$!]{8,}$`" to validate the password.

## Design



## AndroidManifest.xml

```
<?xml version="1.0" encoding="utf-8"?>
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
    package="com.example.parta.program3">

    <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=".LoginActivity"></activity>
```

```

<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>

```

**LoginActivity.java**

```

package com.example.parta.program3;

import androidx.appcompat.app.AppCompatActivity;

import android.os.Bundle;
import android.view.View;
import android.widget.Button;
import android.widget.EditText;
import android.widget.Toast;

public class LoginActivity extends AppCompatActivity implements View.OnClickListener {

    EditText txtLoginUsername;
    EditText txtLoginPassword;
    Button btnLogin;

    String user,pass;

    int count=0;

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

        txtLoginUsername=(EditText)
            findViewById(R.id.txt_login_username);
        txtLoginPassword=(EditText)
            findViewById(R.id.txt_login_password);

        btnLogin=(Button)findViewById(R.id.btn_login_signin);
        btnLogin.setOnClickListener(this);
    }
}

```

```

        Bundle bundle=getIntent().getBundleExtra("data");
        user=bundle.getString("user");
        pass=bundle.getString("pass");
    }
    public void onClick(View v)
    {
        String user1=txtLoginUsername.getText().toString();
        String pass1=txtLoginPassword.getText().toString();

        if(user.equals(user1)&&pass.equals(pass1))
        {
            Toast.makeText(this,"Login Successful"
                ,Toast.LENGTH_LONG).show();
        }
        else
        {
            count++;
            if(count==2)
            {
                btnLogin.setEnabled(false);
                Toast.makeText(this,
                    "Failed Login Attempts "+count
                    ,Toast.LENGTH_LONG).show();
            }
            else
            {
                Toast.makeText(this,"Login Failed "+count
                    ,Toast.LENGTH_LONG).show();
            }
        }
    }
}

```

**MainActivity.java**

```

package com.example.parta.program3;

import androidx.appcompat.app.AppCompatActivity;

import android.content.Intent;
import android.os.Bundle;
import android.os.PatternMatcher;
import android.view.View;
import android.widget.Button;
import android.widget.EditText;
import android.widget.Toast;

```

```
import java.util.regex.Matcher;
import java.util.regex.Pattern;

public class MainActivity extends AppCompatActivity implements View.OnClickListener {

    EditText txtUsername;
    EditText txtPassword;

    Button btnSignup;

    String regularExpression
        ="^^(?=.*[A-Z])(?=.*[a-z])(?=.*\\d)(?=.*[@$!])[A-Za-z]\\d@[$!]{8,}$";

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);
        txtUsername=(EditText)findViewById(R.id.txt_username);
        txtPassword=(EditText)findViewById(R.id.txt_password);

        btnSignup=(Button)findViewById(R.id.btn_signup);
        btnSignup.setOnClickListener(this);

    }

    public void onClick(View v)
    {
        String username=txtUsername.getText().toString();
        String password=txtPassword.getText().toString();

        if(validatePassword(password)) {
            Bundle bundle = new Bundle();
            bundle.putString("user", username);
            bundle.putString("pass", password);

            Intent it = new Intent(this, LoginActivity.class);
            it.putExtra("data", bundle);

            startActivity(it);
        }
        else
        {
            Toast.makeText(getApplicationContext(),
                    "Invalid Password",
                    Toast.LENGTH_LONG).show();
        }
    }
}
```

```
}
```

```
public boolean validatePassword(String password)
{
    Pattern pattern= Pattern.compile(regularExpression);
    Matcher matcher=pattern.matcher(password);
    return matcher.matches();
}
```

### activity\_login.xml

```
<?xml version="1.0" encoding="utf-8"?>
<androidx.constraintlayout.widget.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=".LoginActivity">

    <TextView
        android:id="@+id/textView7"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginTop="50dp"
        android:text="Login"
        android:textSize="22dp"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent" />

    <TextView
        android:id="@+id/textView9"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="30dp"
        android:layout_marginTop="50dp"
        android:text="Username"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toBottomOf="@+id/textView7" />

    <EditText
        android:id="@+id/txt_login_username"
```

```
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="20dp"
        android:layout_marginEnd="20dp"
        android:ems="10"
        android:inputType="textPersonName"
        android:text="Name"
        app:layout_constraintBottom_toBottomOf="@+id/textView9"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toEndOf="@+id/textView9"
        app:layout_constraintTop_toTopOf="@+id/textView9" />

<TextView
    android:id="@+id/textView10"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginStart="30dp"
    android:layout_marginTop="50dp"
    android:text="Password"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toBottomOf="@+id/textView9" />

<EditText
    android:id="@+id/txt_login_password"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:ems="10"
    android:inputType="textPassword"
    app:layout_constraintEnd_toEndOf="@+id/txt_login_username"
    app:layout_constraintStart_toStartOf="@+id/txt_login_username"
    app:layout_constraintTop_toTopOf="@+id/textView10" />

<Button
    android:id="@+id	btn_login_signin"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginTop="50dp"
    android:text="Login"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toBottomOf="@+id/txt_login_password" />
</androidx.constraintlayout.widget.ConstraintLayout>
```

**activity\_main.xml**

```
<?xml version="1.0" encoding="utf-8"?>
<androidx.constraintlayout.widget.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">

    <TextView
        android:id="@+id/textView2"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginTop="100dp"
        android:text="SIGN UP"
        android:textColor="@android:color/background_dark"
        android:textSize="22dp"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent" />

    <TextView
        android:id="@+id/textView3"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="30dp"
        android:layout_marginTop="50dp"
        android:text="USERNAME"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toBottomOf="@+id/textView2" />

    <TextView
        android:id="@+id/textView4"
        android:layout_width="68dp"
        android:layout_height="0dp"
        android:layout_marginTop="50dp"
        android:text="Password"
        app:layout_constraintStart_toStartOf="@+id/textView3"
        app:layout_constraintTop_toBottomOf="@+id/textView3" />

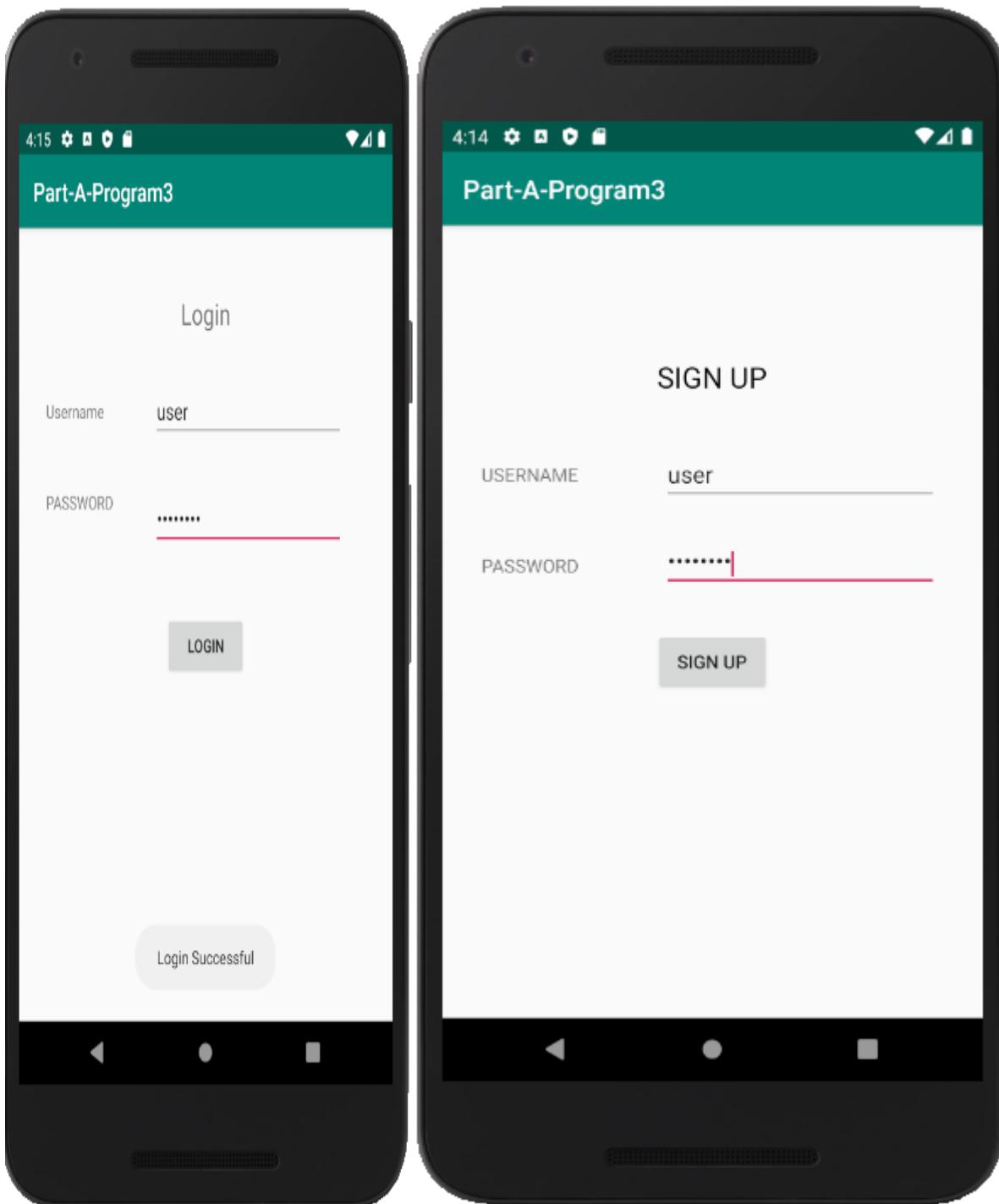
    <EditText
        android:id="@+id/txt_username"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
```

```
        android:layout_marginStart="40dp"
        android:layout_marginEnd="10dp"
        android:ems="10"
        android:inputType="textPersonName"
        android:text="Name"
        app:layout_constraintBottom_toBottomOf="@+id/textView3"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toEndOf="@+id/textView3"
        app:layout_constraintTop_toTopOf="@+id/textView3" />

<EditText
    android:id="@+id/txt_password"
    android:layout_width="0dp"
    android:layout_height="40dp"
    android:layout_marginTop="26dp"
    android:ems="10"
    android:inputType="textPassword"
    app:layout_constraintEnd_toEndOf="@+id/txt_username"
    app:layout_constraintStart_toStartOf="@+id/txt_username"
    app:layout_constraintTop_toBottomOf="@+id/txt_username" />

<Button
    android:id="@+id	btn_signup"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginTop="30dp"
    android:text="Sign Up"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toBottomOf="@+id/txt_password" />
</androidx.constraintlayout.widget.ConstraintLayout>
```

## Sample Output



**4. Develop an application to set an image as wallpaper. On click of a button, the wallpaper image should start to change randomly every 30 seconds.**

1. Create a New Android Project with Empty Activity.

2. Open activity\_main.xml file from res→layout folder, check/add LinearLayout as the root view.

3. Create the layout

4. Add 3 or More images to drawable folder (res→drawable)

**5. Declare uses permission android.permission.SET\_WALLPAPER in the AndroidManifest.xml file**

6. Schedule Timer task to change the wallpaper on every 30 seconds interval.

7. Initialize and use WallpaperManager.setBitmap() method to change the wallpaper.

### AndroidManifest.xml

```
<?xml version="1.0" encoding="utf-8"?>
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
    package="com.example.program4">

    <uses-permission android:name="android.permission.SET_WALLPAPER"/>

    <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>
```

### MainActivity.java

```
package com.example.program4;

import androidx.appcompat.app.AppCompatActivity;

import android.app.WallpaperManager;
import android.graphics.BitmapFactory;
import android.os.Bundle;
import android.view.View;
```

```
import android.widget.Button;

import java.util.Random;
import java.util.Timer;
import java.util.TimerTask;

public class MainActivity extends AppCompatActivity implements View.OnClickListener {

    Button btnChangeWallpaper;

    boolean running;

    int[] imagesArray=new int[]{R.drawable.image1,
    R.drawable.image2,
    R.drawable.image3,R.drawable.image4};

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

        btnChangeWallpaper=(Button)
            findViewById(R.id.btn_start_change_wallpaper);
        btnChangeWallpaper.setOnClickListener(this);

    }

    public void onClick(View v)
    {
        if(!running)
        {
            new Timer().schedule
                (new MyTimer(),30000,30000);
            running=true;
        }
    }

    class MyTimer extends TimerTask
    {
        public void run()
        {
            int aryLength = imagesArray.length;
            Random random = new Random();
            int rNum = random.nextInt(aryLength);

            try {
                WallpaperManager wallpaperManager =
                    WallpaperManager.getInstance(getApplicationContext());

                wallpaperManager.setBitmap
                    (BitmapFactory.decodeResource(getResources(), imagesArray[rNum]));
            }
        }
    }
}
```

```
        }
        catch(Exception e)
        {
        }

    }
}
```

**activity\_main.xml**

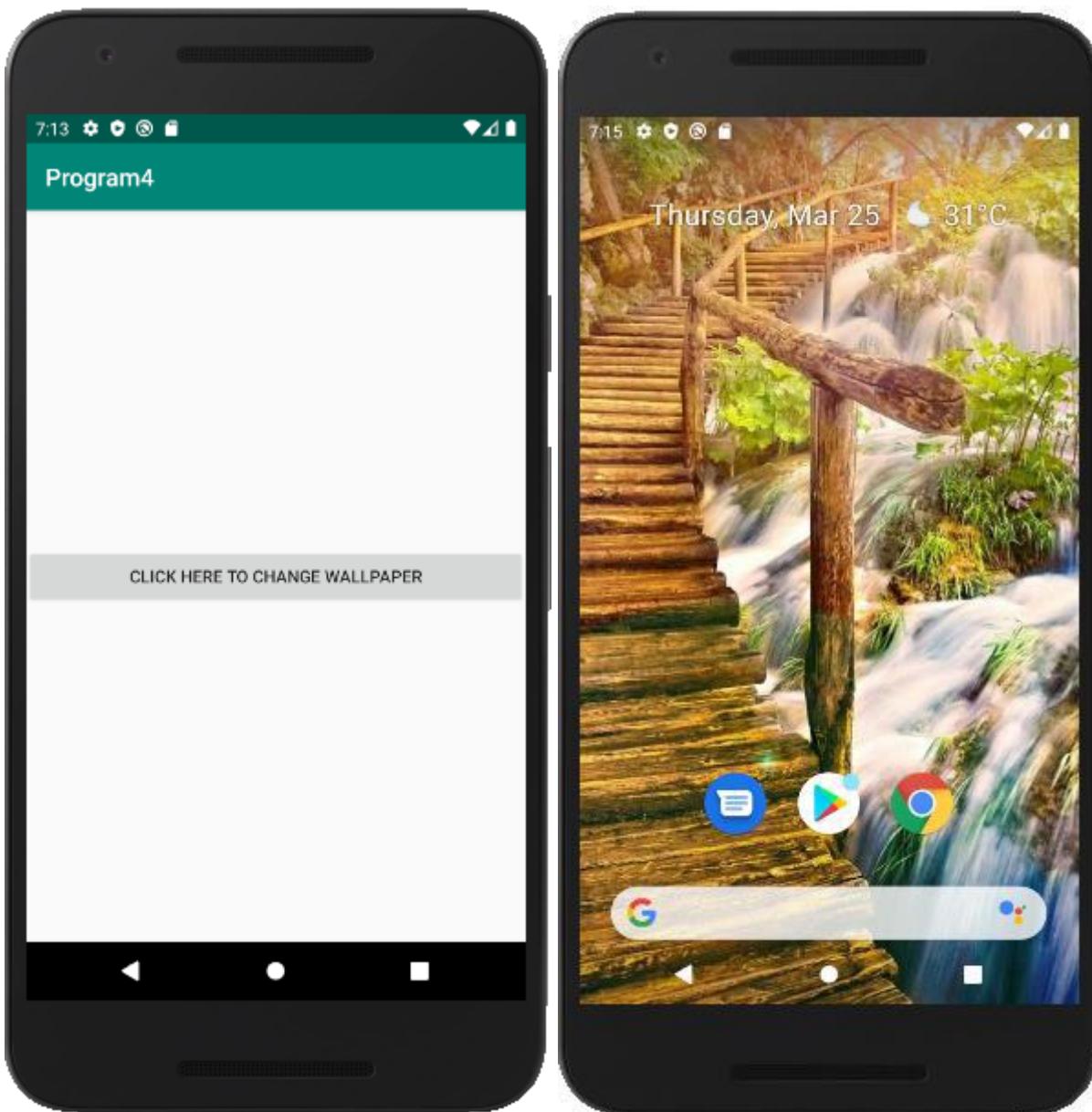
```
<?xml version="1.0" encoding="utf-8"?>
<LinearLayout xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:orientation="vertical"
    android:gravity="center"
    tools:context=".MainActivity">

    <Button
        android:id="@+id	btn_start_change_wallpaper"
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        android:text="Click here to Change Wallpaper" />

</LinearLayout>
```

**Note:** Add all the images in drawable folder

## Sample Output

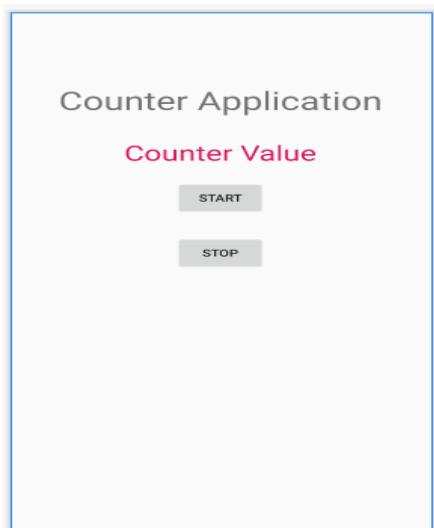


### Program 5

Write a program to create an activity with two buttons START and STOP. On Pressing of the START button, the activity must start the counter by displaying the numbers from One and the counter must keep on counting until the STOP button is pressed. Display the counter value in a TextViewcontrol.

1. Create a New Android Project with Empty Activity.
2. Open activity\_main.xml file from res→layout folder, check/add ConstraintLayout as the root view.
3. Create the layout design using Drag and Drop framework.
4. Add Listeners to Button Click Event:
  - Create a class which implements OnClickListener interface.
  - Override onClick() method of OnClickListener Interface.
  - Register the button for click event by calling setOnClickListener() method of View class and pass the object of the class that implemented OnClickListener Interface.
5. Create a Thread to start the counter logic.
6. Steps to Create a Thread
  - Create a class that extends Thread Class.
  - Override run method of Thread Class.
  - Use start() method of thread class to start the thread.
7. Create Handler class to receive message from child thread, Handler executes in Main Thread.
8. Steps to Create Handler
  - Create Object of type Handler.
  - OverridhandleMessage() of handler class.
9. Pass the counter value to be displayed to the handler.
10. Update the UI to display the counter value received from thread.

### Design



**AndroidManifest.xml**

```
<?xml version="1.0" encoding="utf-8"?>
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
    package="com.example.program5">

    <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>
```

**MainActivity.java**

```
package com.example.program5;

import androidx.appcompat.app.AppCompatActivity;

import android.os.Bundle;
import android.os.Handler;
import android.os.Message;
import android.view.View;
import android.widget.Button;
import android.widget.TextView;

import org.w3c.dom.Text;

public class MainActivity extends AppCompatActivity implements View.OnClickListener {

    TextView lblCounter;
    Button btnStart,btnStop;

    int counter=0;
    boolean running=false;

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);
        lblCounter=(TextView)findViewById(R.id.lbl_text);
        btnStart=(Button)findViewById(R.id.btn_start);
```

```
        btnStop=(Button)findViewById(R.id.btn_stop);
        btnStop.setOnClickListener(this);
        btnStart.setOnClickListener(this);
        btnStop.setEnabled(false);
    }

    public void onClick(View v)
    {
        if(v.equals(btnStart))
        {
            counter=0;
            running=true;
            new MyCounter().start();
            btnStart.setEnabled(false);
            btnStop.setEnabled(true);
        }
        else if(v.equals(btnStop))
        {
            running=false;
            btnStart.setEnabled(true);
            btnStop.setEnabled(false);
        }
    }

    Handler handler=new Handler()
    {
        public void handleMessage(Message m)
        {
            lblCounter.setText(String.valueOf(m.what));
        }
    };

    class MyCounter extends Thread
    {
        public void run()
        {
            while(running)
            {
                counter++;
                handler.sendMessage(counter);
                try {
                    Thread.sleep(1000);
                }
                catch(Exception e)
                {

                }
            }
        }
    }
}
```

**activity\_main.xml**

```
<?xml version="1.0" encoding="utf-8"?>
<androidx.constraintlayout.widget.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:id="@+id/lbl_counter"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    tools:context=".MainActivity">

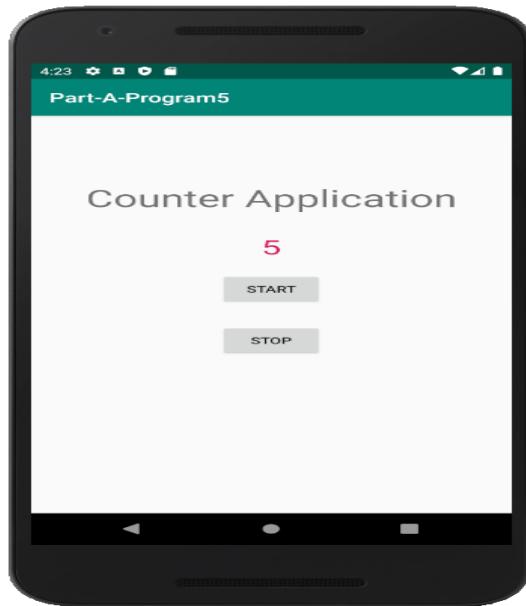
    <TextView
        android:id="@+id/textView"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginTop="100dp"
        android:text="Counter Application"
        android:textSize="18dp"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent" />

    <TextView
        android:id="@+id/lbl_text"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginTop="30dp"
        android:text="0"
        android:textColor="@color/colorAccent"
        android:textSize="50dp"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toBottomOf="@+id/textView" />

    <Button
        android:id="@+id/btn_start"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginTop="20dp"
        android:text="Start"
        app:layout_constraintEnd_toEndOf="parent"
```

```
app:layout_constraintStart_toStartOf="parent"
app:layout_constraintTop_toBottomOf="@+id/lbl_text" />
```

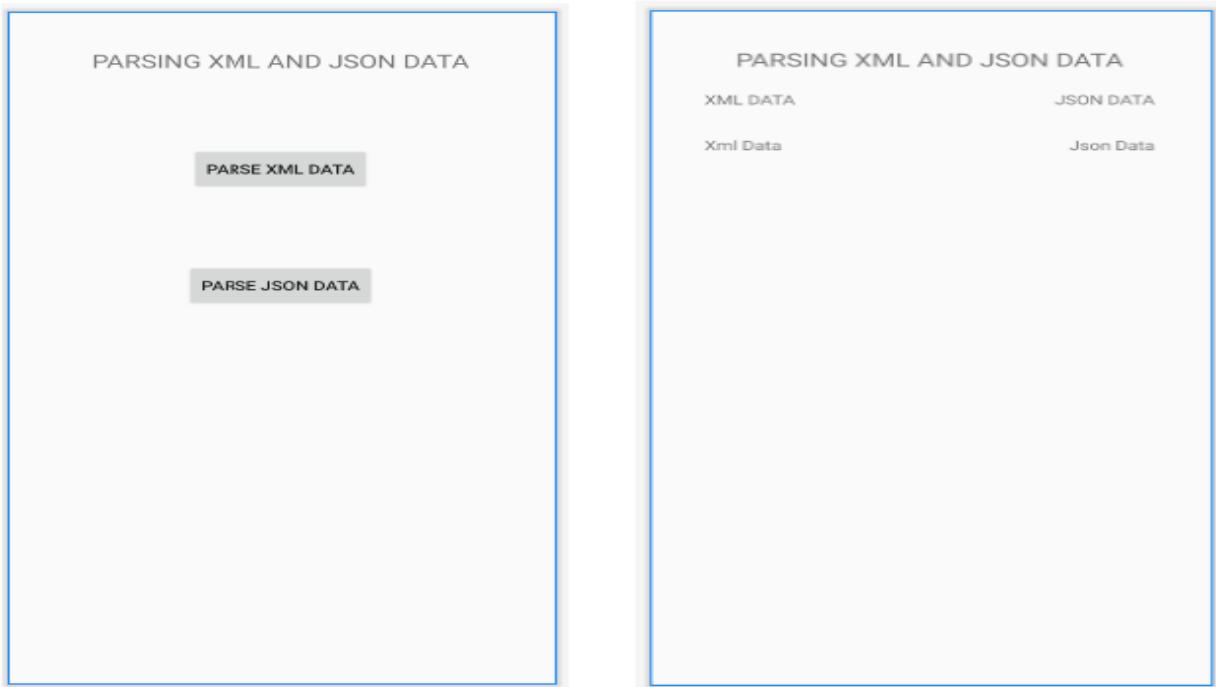
## OUTPUT



## Program 6

Create two files of XML and JSON type with values for City\_Name, Latitude, Longitude, Temperature, and Humidity. Develop an application to create an activity with two buttons to parse the XML and JSON files which when clicked should display the data in their respective layouts side by side.

1. Create a New Android Project with Empty Activity.
2. Open activity\_main.xml file from res→layout folder, check/add ConstraintLayout as the root view.
3. Create the layout design using Drag and Drop framework.
4. Add Listeners to Button Click Event:
  - Create a class which implements OnClickListener interface.
  - Override onClick() method of OnClickListener Interface.
  - Register the button for click event by calling setOnClickListener() method of View class and pass the object of the class that implemented OnClickListener Interface.
5. Create assets folder (Refer Section Android Studio Tutorial)
6. Create **input.xml** file inside assets folder and paste the below Xml Data
7. Create **input.json** file inside assets folder and paste the below Json Data
8. Read the XML and Json Data in the files and display on screen



**AndroidManifest.xml**

```

<?xml version="1.0" encoding="utf-8"?>
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
    package="com.example.parta_program6">

    <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=".ViewActivity"></activity>
        <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>

```

**MainActivity.java**

```

package com.example.parta_program6;

import androidx.appcompat.app.AppCompatActivity;
import android.content.Intent;
import android.os.Bundle;
import android.view.View;
import android.widget.Button;

public class MainActivity extends AppCompatActivity implements View.OnClickListener {

    Button btnParseXml,btnParseJson;

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);
        btnParseXml=(Button)findViewById(R.id.btn_parsexml);
        btnParseJson=(Button)findViewById(R.id.btn_parsejson);
        btnParseJson.setOnClickListener(this);
    }
}

```

```
btnParseXml.setOnClickListener(this);  
}  
  
@Override  
public void onClick(View v) {  
  
    if(v.equals(btnParseJson))  
    {  
        Intent it=new Intent(this,ViewActivity.class);  
        it.putExtra("mode",1);  
        startActivity(it);  
    }  
    else if(v.equals(btnParseXml))  
    {  
        Intent it=new Intent(this,ViewActivity.class);  
        it.putExtra("mode",2);  
        startActivity(it);  
    }  
}
```

### ViewActivity.java

```
package com.example.parta_program6;  
  
import androidx.appcompat.app.AppCompatActivity;  
  
import android.os.Bundle;  
import android.widget.TextView;  
  
import org.json.JSONObject;  
import org.w3c.dom.Document;  
import org.w3c.dom.Element;  
import org.w3c.dom.Node;  
import org.w3c.dom.NodeList;  
  
import java.io.IOException;  
import java.io.InputStream;  
  
import javax.xml.parsers.DocumentBuilder;  
import javax.xml.parsers.DocumentBuilderFactory;  
  
public class ViewActivity extends AppCompatActivity {
```

```

TextView lblData;

int mode=0;
@Override
protected void onCreate(Bundle savedInstanceState) {
    super.onCreate(savedInstanceState);
    setContentView(R.layout.activity_view);
    lblData=(TextView)findViewById(R.id.lbl_data);
    mode=getIntent().getIntExtra("mode",0);

    if(mode==1)
    {
        parseJson();
    }
    else
    {
        parseXmlDocument();
    }
}

public String parseXmlDocument()
{
    try {

        InputStream is = getAssets().open("input.xml");

        DocumentBuilderFactory dbFactory = DocumentBuilderFactory.newInstance();
        DocumentBuilder dBuilder = dbFactory.newDocumentBuilder();
        Document doc = dBuilder.parse(is);

        Element element=doc.getDocumentElement();
        element.normalize();

        NodeList nList = doc.getElementsByTagName("employee");

        for (int i=0; i<nList.getLength(); i++) {

            Node node = nList.item(i);
            if (node.getNodeType() == Node.ELEMENT_NODE) {
                Element element2 = (Element) node;
                lblData.setText("City Name : " + getValue("city_name", element2)+"\n");
                lblData.append("Latitude : " + getValue("Latitude", element2)+"\n");
                lblData.append("Longitude : " + getValue("Longitude", element2)+"\n");
                lblData.append("Temperature : " + getValue("Temperature", element2)+"\n");
                lblData.append("Humidity : " + getValue("Humidity", element2)+"\n");
            }
        }
    }
}

```

```

        }
    }

} catch (Exception e) {e.printStackTrace();}
return null;
}

private static String getValue(String tag, Element element) {
    NodeList nodeList = element.getElementsByTagName(tag).item(0).getChildNodes();
    Node node = nodeList.item(0);
    return node.getNodeValue();
}

public void parseJson()
{
    try {
        InputStream inputStream=getAssets().open("input.json");
        byte[] data=new byte[inputStream.available()];
        inputStream.read(data);

        String readData=new String(data);
        JSONObject jsonObject=new JSONObject(readData);
        JSONObject jsonObject1=jsonObject.getJSONObject("employee");
        lblData.setText("City Name:" +jsonObject1.getString("city_name")+"\n");
        lblData.append("Latitude:" +jsonObject1.getString("Latitude")+"\n");
        lblData.append("Longitude" +jsonObject1.getString("Longitude")+"\n");
        lblData.append("Temperature:" +jsonObject1.getInt("Temperature")+"\n");
        lblData.append("Humidity" +jsonObject1.getString("Humidity")+"\n");

    } catch (Exception e) {
        e.printStackTrace();
    }
}

```

**activity\_main.xml**

```

<?xml version="1.0" encoding="utf-8"?>
<androidx.constraintlayout.widget.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_parsexml"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginTop="150dp"
    android:text="Parse XML"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toTopOf="parent" />

<Button
    android:id="@+id	btn_parsejson"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginTop="80dp"
    android:text="Parse Json"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toBottomOf="@+id	btn_parsexml" />
</androidx.constraintlayout.widget.ConstraintLayout>

```

**activity\_view.xml**

```

<?xml version="1.0" encoding="utf-8"?>
<androidx.constraintlayout.widget.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=".ViewActivity">

    <TextView
        android:id="@+id/lbl_data"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text="TextView"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent" />
</androidx.constraintlayout.widget.ConstraintLayout>

```

**Create a assets folder and then create a input.xml and input.json file in the asset folder**

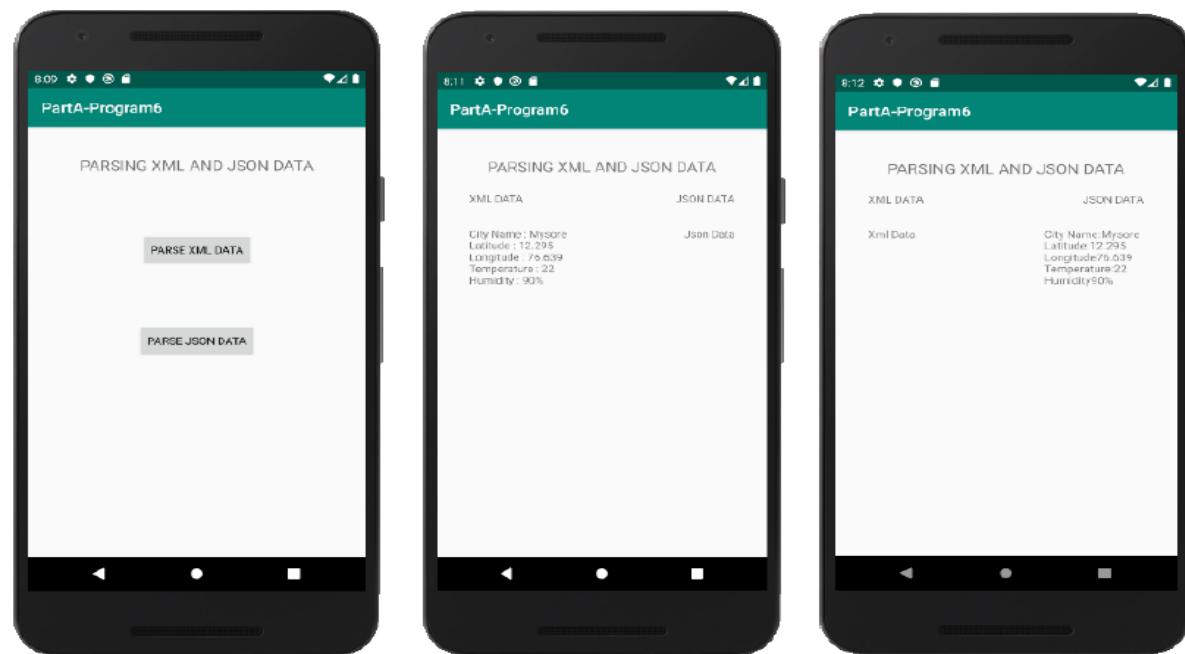
---

**input.xml**

```
<?xml version="1.0"?>
<records>
<employee>
<city_name>Mysore</city_name>
<Latitude>12.295</Latitude>
<Longitude>76.639</Longitude>
<Temperature>22</Temperature>
<Humidity>90%</Humidity>
</employee>
</records>
```

**input.json**

```
{
  "employee": {
    "city_name": "Mysore",
    "Latitude": "12.295",
    "Longitude": "76.639",
    "Temperature": 22,
    "Humidity": "90%"
  }
}
```

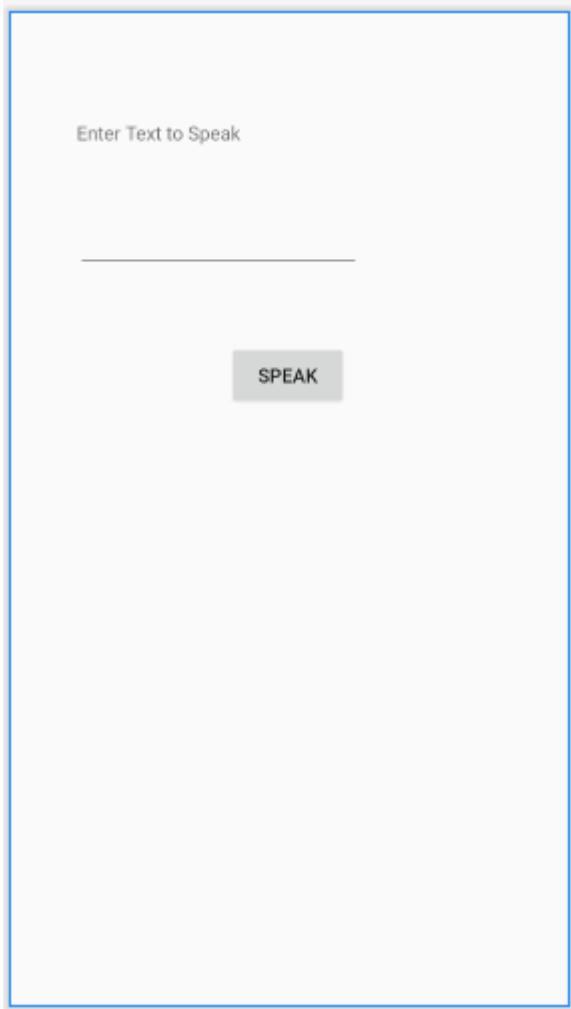
**Sample Output**

## Program 7

**Develop a simple application with one EditText so that the user can write some text in it. Create a button called “Convert Text to Speech” that converts the user input text into voice.**

1. Create a New Android Project with Empty Activity.
2. Open activity\_main.xml file from res→layout folder, check/add ConstraintLayout as the root view.
3. Create the layout design using Drag and Drop framework.
4. Add Listeners to Button Click Event:
  - Create a class which implements OnClickListener interface.
  - Override onClick() method of OnClickListener Interface.
  - Register the button for click event by calling setOnClickListener() method of View class and pass the object of the class that implemented OnClickListener Interface.
5. Initialize TextToSpeech Engine and the Language to Speak using setLanguage() method
6. Use Speak() method to speak the text passed to it.

## Design



### AndroidManifest.xml

```
<?xml version="1.0" encoding="utf-8"?>
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
    package="com.example.parta.parta_program7">

    <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>
```

### MainActivity.java

```
package com.example.parta.parta_program7;

import androidx.appcompat.app.AppCompatActivity;

import android.os.Bundle;
import android.speech.tts.TextToSpeech;
import android.view.View;
import android.widget.Button;
import android.widget.EditText;
import android.widget.Toast;

public class MainActivity extends AppCompatActivity implements View.OnClickListener {

    EditText txtSpeak;
    Button btnSpeak;
    TextToSpeech textToSpeech;

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);
        txtSpeak=(EditText)findViewById(R.id.editText);
        btnSpeak=(Button)findViewById(R.id.btn_speak);
        btnSpeak.setOnClickListener(this);
        textToSpeech=new TextToSpeech(getApplicationContext(),
            new TextToSpeech.OnInitListener() {
                @Override
                public void onInit(int status) {
                    if(status!=TextToSpeech.ERROR)
                    {
                        Toast.makeText(getApplicationContext(),
                            "Success",
                            Toast.LENGTH_LONG).show();
                    }
                }
            });
    }

    public void onClick(View v)
    {
```

```

String text=txtSpeak.getText().toString();
textToSpeech.speak(text,
    TextToSpeech.QUEUE_FLUSH,null);
}

}

```

**activity\_main.xml**

```

<?xml version="1.0" encoding="utf-8"?>
<androidx.constraintlayout.widget.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:id="@+id/txt_texttospeak"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    tools:context=".MainActivity">

    <TextView
        android:id="@+id/textView"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="50dp"
        android:layout_marginTop="80dp"
        android:text="Enter Text to Speak"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent" />

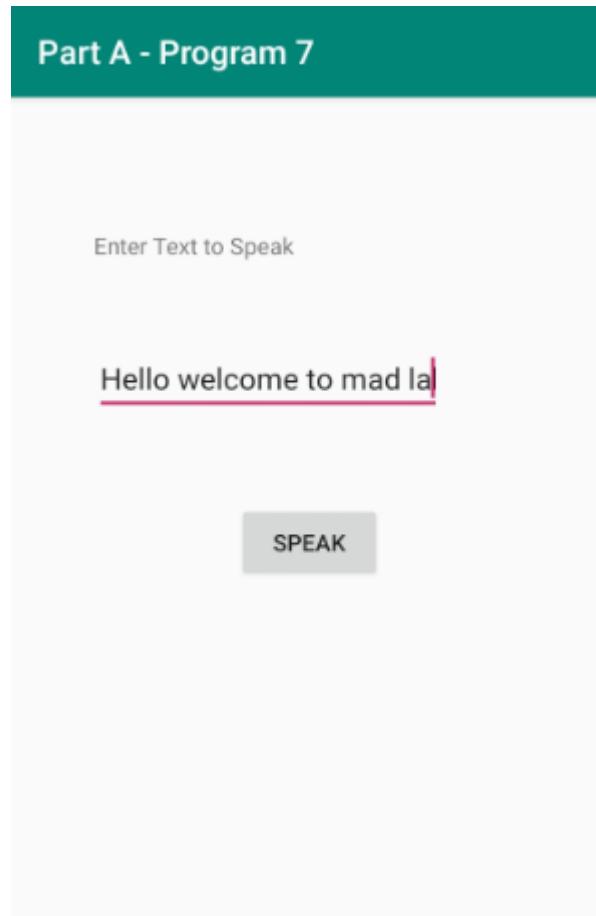
    <EditText
        android:id="@+id/editText"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginTop="48dp"
        android:ems="10"
        android:inputType="textPersonName"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.0"
        app:layout_constraintStart_toStartOf="@+id/textView"
        app:layout_constraintTop_toBottomOf="@+id/textView" />

    <Button
        android:id="@+id	btn_speak"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"

```

```
        android:layout_marginTop="52dp"
        android:text="Speak"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toBottomOf="@+id/editText" />
</androidx.constraintlayout.widget.ConstraintLayout>
```

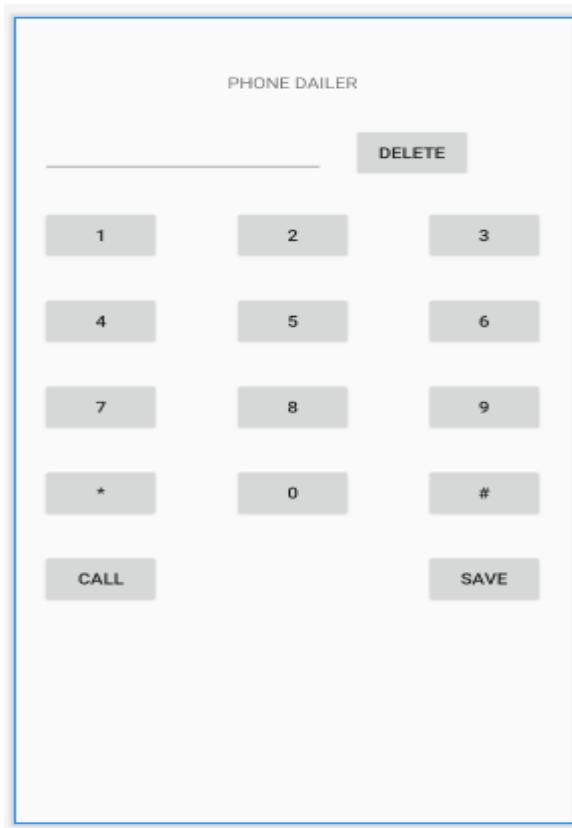
### Sample Output



**8. Create an activity like a phone dialer with CALL and SAVE buttons. On pressing the CALL button, it must call the phone number and on pressing the SAVE button it must save the number to the phone contacts.**

1. Create a New Android Project with Empty Activity.
2. Open activity\_main.xml file from res→layout folder, check/add ConstraintLayout as the root view.
3. Create the layout design using Drag and Drop framework.
4. Add Listeners to Button Click Event:
  - Create a class which implements OnClickListener interface.
  - Override onClick() method of OnClickListener Interface.
  - Register the button for click event by calling setOnClickListener() method of View class and pass the object of the class that implemented OnClickListener Interface.
5. Declare uses permission android.permission.CALL\_PHONE in the manifest file.
6. Use ACTION\_CALL intent name and pass the “tel:<phone-number>” as URI in intent data and start the call activity.
7. Use intent name and pass the “Telephone Number” and “unknown” as name as intent data call Contacts Save Activity.

## Design



**AndroidManifest.xml**

```
<?xml version="1.0" encoding="utf-8"?>
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
    package="com.example.part_a_program_8">

    <uses-permission
        android:name="android.permission.CALL_PHONE"/>

    <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>
```

**MainActivity.java**

```
package com.example.part_a_program_8;

import androidx.appcompat.app.AppCompatActivity;

import android.content.Intent;
import android.net.Uri;
import android.os.Bundle;
import android.provider.ContactsContract;
import android.view.View;
import android.widget.Button;
import android.widget.EditText;

public class MainActivity extends AppCompatActivity implements View.OnClickListener {

    Button btnOne,btnTwo,btnThree,btnFour,btnFive;
    Button btnSix,btnSeven,btnEight,btnNine,btnZero;
```

```
Button btnDel,btnStar,btnHash,btnCall,btnSave;  
  
EditText txtPhonenumber;  
  
@Override  
protected void onCreate(Bundle savedInstanceState) {  
    super.onCreate(savedInstanceState);  
    setContentView(R.layout.activity_main);  
  
    btnOne=(Button)findViewById(R.id.btn_one);  
    btnOne.setOnClickListener(this);  
  
    btnTwo=(Button)findViewById(R.id.btn_two);  
    btnTwo.setOnClickListener(this);  
  
    btnThree=(Button)findViewById(R.id.btn_three);  
    btnThree.setOnClickListener(this);  
  
    btnFour=(Button)findViewById(R.id.btn_four);  
    btnFour.setOnClickListener(this);  
  
    btnFive=(Button)findViewById(R.id.btn_five);  
    btnFive.setOnClickListener(this);  
  
    btnSix=(Button)findViewById(R.id.btn_six);  
    btnSix.setOnClickListener(this);  
  
    btnSeven=(Button)findViewById(R.id.btn_seven);  
    btnSeven.setOnClickListener(this);  
  
    btnEight=(Button)findViewById(R.id.btn_eight);  
    btnEight.setOnClickListener(this);  
  
    btnNine=(Button)findViewById(R.id.btn_nine);  
    btnNine.setOnClickListener(this);  
  
    btnZero=(Button)findViewById(R.id.btn_zero);  
    btnZero.setOnClickListener(this);  
  
    btnStar=(Button)findViewById(R.id.btn_start);  
    btnStar.setOnClickListener(this);  
  
    btnHash=(Button)findViewById(R.id.btn_hash);  
    btnHash.setOnClickListener(this);
```

```
btnCall=(Button)findViewById(R.id.btn_call);
btnCall.setOnClickListener(this);

btnSave=(Button)findViewById(R.id.btn_save);
btnSave.setOnClickListener(this);

btnDel=(Button)findViewById(R.id.btn_delete);
btnDel.setOnClickListener(this);

txtPhonenumber=(EditText)findViewById(R.id.txt_phonenumber);

txtPhonenumber.setText("");


}

public void onClick(View v)
{
    if(v.equals(btnOne))
    {
        txtPhonenumber.append("1");
    }
    else if(v.equals(btnTwo))
    {
        txtPhonenumber.append("2");
    }
    else if(v.equals(btnThree))
    {
        txtPhonenumber.append("3");
    }
    else if(v.equals(btnFour))
    {
        txtPhonenumber.append("4");
    }
    else if(v.equals(btnFive))
    {
        txtPhonenumber.append("5");
    }
    else if(v.equals(btnSix))
    {
        txtPhonenumber.append("6");
    }
    else if(v.equals(btnSeven))
    {
        txtPhonenumber.append("7");
    }
}
```

```

else if(v.equals(btnEight))
{
    txtPhonenumber.append("8");
}
else if(v.equals(btnNine))
{
    txtPhonenumber.append("9");
}
else if(v.equals(btnZero))
{
    txtPhonenumber.append("0");
}
else if(v.equals(btnStar))
{
    txtPhonenumber.append("*");
}
else if(v.equals(btnHash))
{
    txtPhonenumber.append("#");
}
else if(v.equals(btnSave))
{

Intent contactIntent = new Intent
        (ContactsContract.Intents.Insert.ACTION);
contactIntent.setType
        (ContactsContract.RawContacts.CONTENT_TYPE);

contactIntent
        .putExtra(ContactsContract.Intents.Insert.NAME,
        "Unknown");
contactIntent.putExtra(ContactsContract.Intents.Insert.PHONE,
        txtPhonenumber.getText().toString());

startActivity(contactIntent);

}

else if(v.equals(btnCall))
{
    String data=txtPhonenumber.getText().toString();
    Intent it=new Intent(Intent.ACTION_CALL);
    it.setData(Uri.parse("tel:"+data));
    startActivity(it);

}

else if(v.equals(btnDel))
{
}

```

```
{  
    String data=txtPhonenumber.getText().toString();  
    if(data.length()>0)  
    {  
        txtPhonenumber.setText  
        (data.substring(0,data.length()-1));  
  
    }  
    else  
    {  
        txtPhonenumber.setText("");  
    }  
  
}  
}  
  
}
```

### activity\_main.xml

```
<?xml version="1.0" encoding="utf-8"?>  
<androidx.constraintlayout.widget.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">  
  
<TextView  
    android:id="@+id/textView"  
    android:layout_width="wrap_content"  
    android:layout_height="wrap_content"  
    android:layout_marginTop="50dp"  
    android:text="PHONE DIALER"  
    app:layout_constraintEnd_toEndOf="parent"  
    app:layout_constraintStart_toStartOf="parent"  
    app:layout_constraintTop_toTopOf="parent" />  
  
<EditText  
    android:id="@+id/txt_phonenumber"  
    android:layout_width="wrap_content"
```

```
    android:layout_height="wrap_content"
    android:layout_marginStart="20dp"
    android:layout_marginTop="30dp"
    android:ems="10"
    android:inputType="textPersonName"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toBottomOf="@+id/textView" />
```

<Button

```
    android:id="@+id	btn_delete"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginStart="20dp"
    android:layout_marginTop="30dp"
    android:text="Delete"
    app:layout_constraintStart_toEndOf="@+id/txt_phonenumber"
    app:layout_constraintTop_toBottomOf="@+id/textView" />
```

<Button

```
    android:id="@+id	btn_one"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginStart="20dp"
    android:layout_marginTop="30dp"
    android:text="1"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toBottomOf="@+id/txt_phonenumber" />
```

<Button

```
    android:id="@+id	btn_two"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginTop="30dp"
    android:text="2"
    app:layout_constraintEnd_toStartOf="@+id	btn_three"
    app:layout_constraintStart_toEndOf="@+id	btn_one"
    app:layout_constraintTop_toBottomOf="@+id/txt_phonenumber" />
```

<Button

```
    android:id="@+id	btn_three"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginTop="30dp"
    android:layout_marginEnd="20dp"
    android:text="3"
    app:layout_constraintEnd_toEndOf="parent"
```

```
app:layout_constraintTop_toBottomOf="@+id/txt_phonenumber" />
```

```
<Button
```

```
    android:id="@+id	btn_four"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginStart="20dp"
    android:layout_marginTop="30dp"
    android:text="4"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toBottomOf="@+id	btn_one" />
```

```
<Button
```

```
    android:id="@+id	btn_five"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginTop="30dp"
    android:text="5"
    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="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginTop="30dp"
    android:layout_marginEnd="20dp"
    android:text="6"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintTop_toBottomOf="@+id	btn_three" />
```

```
<Button
```

```
    android:id="@+id	btn_seven"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginStart="20dp"
    android:layout_marginTop="30dp"
    android:text="7"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toBottomOf="@+id	btn_four" />
```

```
<Button
```

```
    android:id="@+id	btn_eight"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
```

```
    android:layout_marginTop="30dp"
    android:text="8"
    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="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginTop="30dp"
    android:layout_marginEnd="20dp"
    android:text="9"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintTop_toBottomOf="@+id	btn_six" />
```

```
<Button
    android:id="@+id	btn_zero"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginTop="30dp"
    android:text="0"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toBottomOf="@+id	btn_eight" />
```

```
<Button
    android:id="@+id	btn_call"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginStart="20dp"
    android:layout_marginTop="30dp"
    android:text="Call"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toBottomOf="@+id	btn_zero" />
```

```
<Button
    android:id="@+id	btn_save"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginTop="30dp"
    android:layout_marginEnd="20dp"
    android:text="Save"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintTop_toBottomOf="@+id	btn_zero" />
```

```
<Button  
    android:id="@+id	btn_start"  
    android:layout_width="wrap_content"  
    android:layout_height="wrap_content"  
    android:layout_marginStart="20dp"  
    android:layout_marginTop="30dp"  
    android:text="*"  
    app:layout_constraintStart_toStartOf="parent"  
    app:layout_constraintTop_toBottomOf="@+id	btn_seven" />  
  
<Button  
    android:id="@+id	btn_hash"  
    android:layout_width="wrap_content"  
    android:layout_height="wrap_content"  
    android:layout_marginTop="30dp"  
    android:layout_marginEnd="20dp"  
    android:text="#"  
    app:layout_constraintEnd_toEndOf="parent"  
    app:layout_constraintTop_toBottomOf="@+id	btn_nine" />  
</androidx.constraintlayout.widget.ConstraintLayout>
```

### Sample Output

