VISVESVARAYA TECHNOLOGICAL UNIVERSITY

JNANA SANGAMA, BELGAVI – 590018, KARNATAKA

MOBILE APPLICATION DEVELOPMENT – 18CSMP68

LAB MANUAL

VISVESVARAYA TECHNOLOGICAL UNIVERSITY

JNANA SANGAMA, BELGAVI – 590018, KARNATAKA

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Hardware and Software Requirements

Google provides Android Studio for the Windows, Mac OS X and Linux platforms. You can download Android Studio from the Android Studio home page, (https://developer.android.com/studio/index.html) where you will also find the traditional SDK's with Android Studio's command-line tools. Before downloading Android Studio, make sure your platform meets the following requirements:

Windows requirements

- Microsoft Windows 7/8/10 (32 bit or 64 – bit)
- 3 GB RAM minimum and 1 GB of available disk space
- 1280 * 800 minimum screen resolution
- JDK 8 or higher versions

Linux OS requirements

- GNOME or KDE desktop, 64-bit distribution capable of running 32-bit applications
- GNU C library (glibc) 2.19 or later
- 3 GB RAM minimum and 1 GB of available disk space
- 1280 * 800 minimum screen resolution
- JDK 8 or higher versions

Availabilty of Source Code

Download the source code for Part A programs @
https://tinyurl.com/18CSMP68-Part-A

Download the source code for Part B, 1st to 4th program @
https://tinyurl.com/18CSMP68-Part-B-1-to-4

Download the source code for Part B, 5th program @
https://tinyurl.com/18CSMP68-Part-B-5

Download the source code for Part B, 6th to 8th program @
https://tinyurl.com/18CSMP68-Part-B-6-to-8

You are encouraged to run each of these programs. All the programs are tested using Android Studio 3.5 on Windows platform.

Note: The authors assume no responsibility for errors and omissions resulting from the use of the information contained herein.

MOBILE APPLICATION DEVELOPMENT
(Effective from the academic year 2018 -2019)
SEMESTER – VI

Subject Code	**18CSMP68**	IA Marks	40
Number of Contact Hours/Week	**0:0:2**	Exam Marks	60
Total Number of Contact Hours	**3 Hours/Week**	Exam Hours	03

CREDITS – 02

Laboratory Objectives: This laboratory will enable students to

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

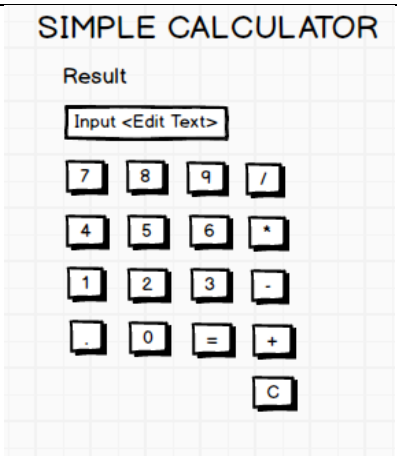
Descriptions (if any):

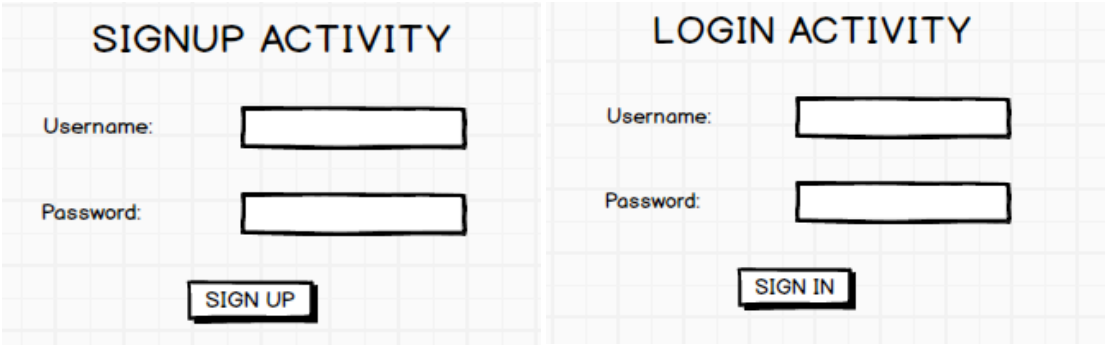
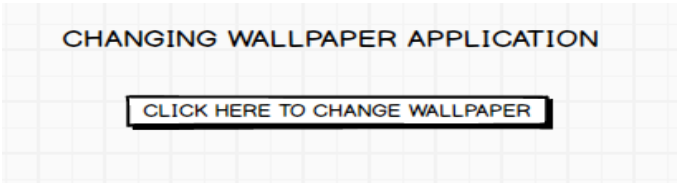
Installation procedure of the Android Studio/Java software must be demonstrated, carried out in groups.
Students should use the latest version of Android Studio/Java to execute these programs.
All of these diagrams are for representational purpose only. Students are expected to improvise on it.

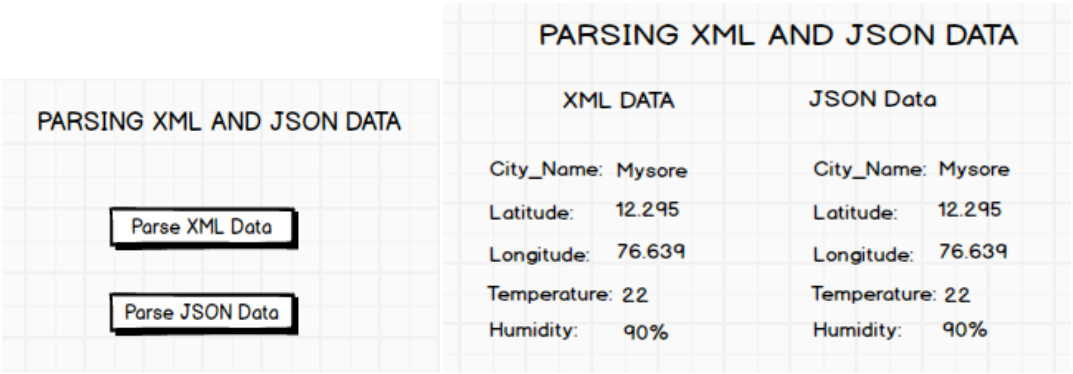
Programs List:

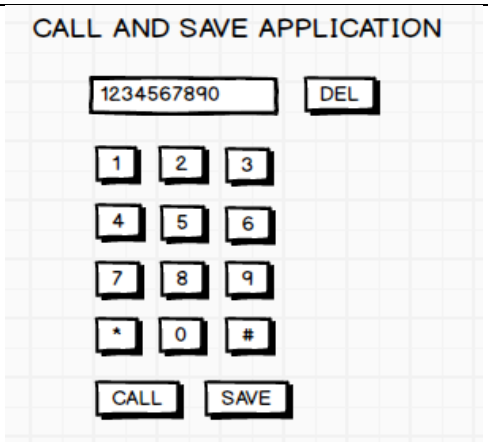
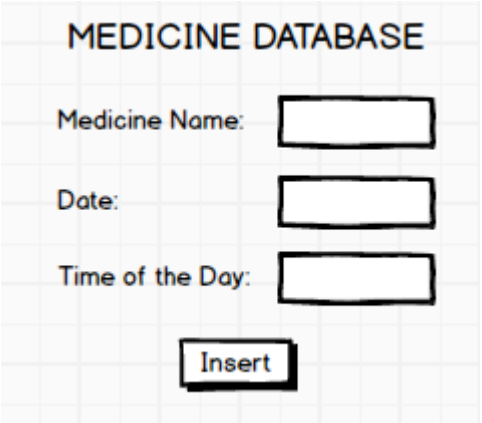
PART – A

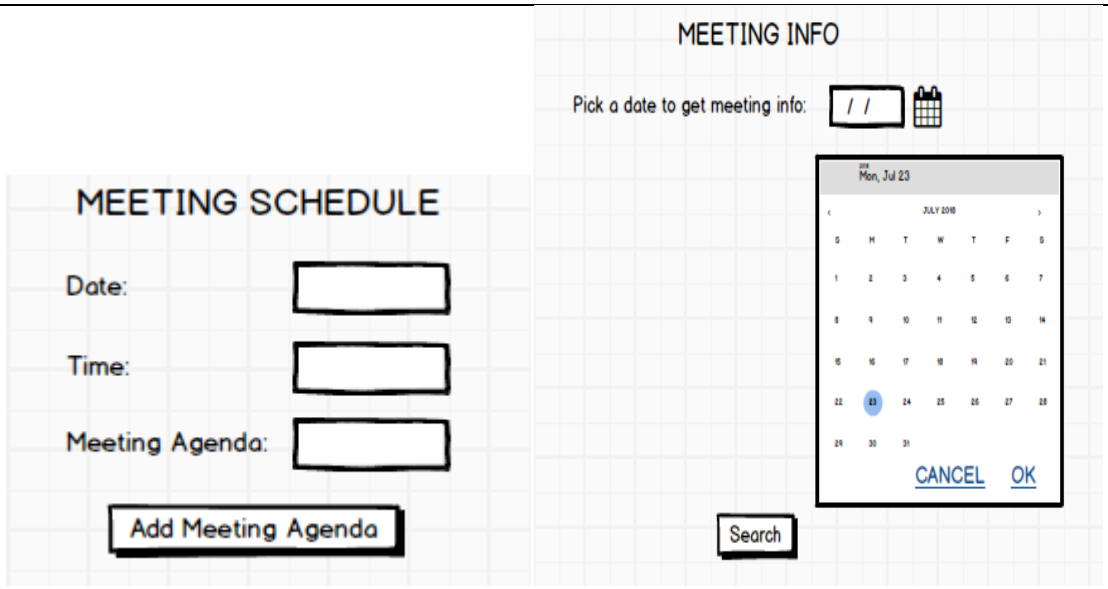
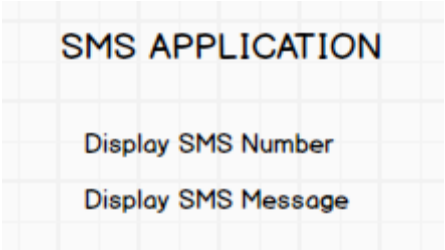
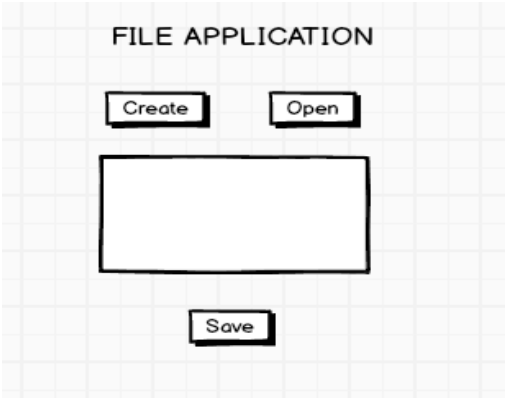
1	Create an application to design a Visiting Card. The Visiting card should have a company logo at the top right corner. The company name should be displayed in Capital letters, aligned to the center. Information like the name of the employee, job title, phone number, address, email, fax and the website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

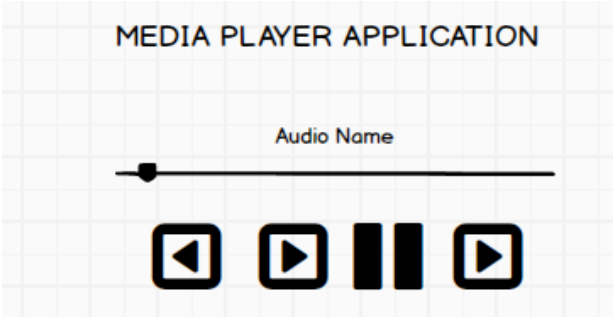
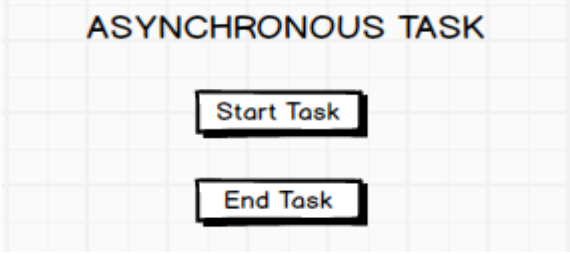
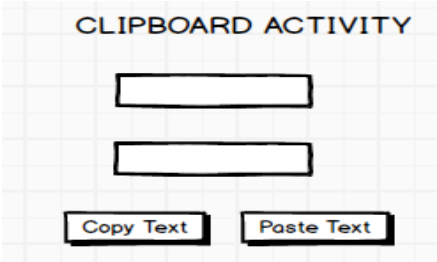
<table>
<tr><td></td><td> 
</td></tr>
<tr><td>3</td><td>Create a SIGN Up activity with Username and Password. Validation of password should happen based on the following rules:
• Password should contain uppercase and lowercase letters.
• Password should contain letters and numbers.
• Password should contain special characters.
• Minimum length of the password (the default value is 8).

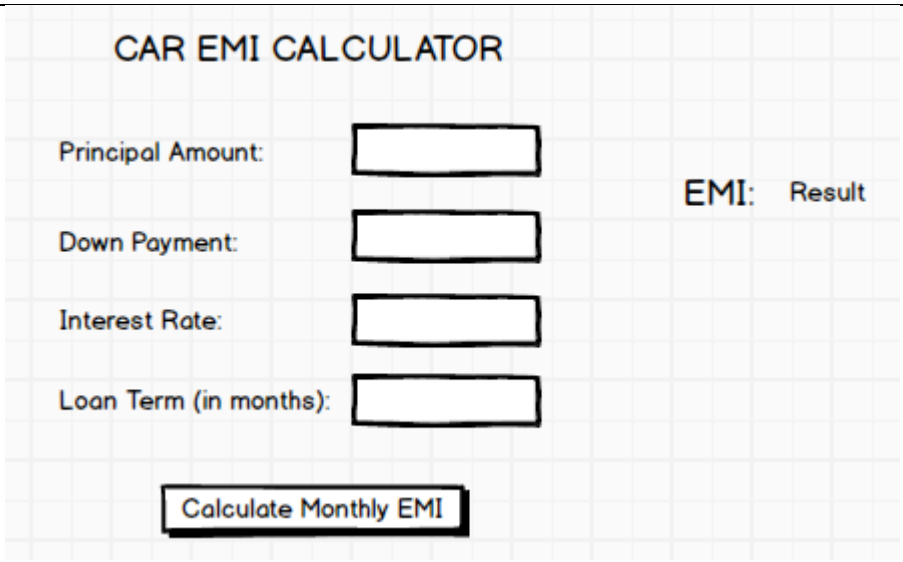
On successful SIGN UP proceed to the next Login activity. Here the user should SIGN IN using the Username and Password created during signup activity. If the Username and Password are matched then navigate to the next activity which displays a message saying “Successful Login” or else display a toast 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.
 
</td></tr>
<tr><td>4</td><td>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.
 
</td></tr>
</table>

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 TextView 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. 
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 DatePicker 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 $\mathbf{E = P * (r(1+r)^n)/((1+r)^n-1)}$ 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: After studying these laboratory programs, students will be able to

- Create, test and debug Android application by setting up Android development environment.
- Implement adaptive, responsive user interfaces that work across a wide range of devices.
- Infer long running tasks and background work in Android applications.
- Demonstrate methods in storing, sharing and retrieving data in Android applications.
- Infer the role of permissions and security for Android applications.

Procedure to Conduct Practical Examination

- Experiment distribution
  - For laboratories having only one part: Students are allowed to pick one experiment from the lot with equal opportunity.
  - For laboratories having PART A and PART B: Students are allowed to pick one experiment from PART A and one experiment from PART B, with equal opportunity.

- Change of experiment is allowed only once and marks allotted for procedure to be made zero of the changed part only.
- Marks Distribution (Subjected to change in accordance with university regulations)
  - For laboratories having only one part – Procedure + Execution + Viva-Voce: 15+70+15 = 100 Marks
  - For laboratories having PART A and PART B
    i. Part A – Procedure + Execution + Viva = 6 + 28 + 6 = 40 Marks
    ii. Part B – Procedure + Execution + Viva = 9 + 42 + 9 = 60 Marks

Text Books:

1. Google Developer Training, **"Android Developer Fundamentals Course – Concept Reference",** Google Developer Training Team, 2017. https://www.gitbook.com/book/google-developer-training/android-developer-fundamentals-course-concepts/details
(Download pdf file from the above link)

Reference Books:

1) Erik Hellman, **"Android Programming – Pushing the Limits",** 1st Edition, Wiley India Pvt Ltd, 2014. ISBN-13: 978-8126547197
2) Dawn Griffiths and David Griffiths, **"Head First Android Development",** 1st Edition,

O'Reilly SPD Publishers, 2015. ISBN-13: 978-9352131341
3) Bill Phillips, Chris Stewart and Kristin Marsicano, **"Android Programming: The Big Nerd Ranch Guide",** 3rd Edition, Big Nerd Ranch Guides, 2017. ISBN-13: 978-0134706054

CONTENTS

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.	**83**
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.	**88**
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".	**94**
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Create your First Android Application

Android applications are written in Java, and use XML extensively. We shall assume that you have basic knowledge of Java and XML. Goto "Android Guides" @ https://developer.android.com/guide/index.html. Read "Building your first app".

Creating a New Android Project

Step1: Launch Android Studio.

Step 2: Select File → New → New Project

Step 3: In "Choose your project", select "Phone and Tablet" tab → "Empty Activity" → Next.

Step 4: In "Configure your project" → Set "Name" to "Hello Android" (this will be the "Title" in your phone's application menu) → The "Package name" and "Save Location" will be updated automatically → In "Language", select "Java" → Leave the "Minimum API Level" and the rest to default → Finish.

It could take a few minutes to set up your first app. Watch the "progress bar" at the bottom status bar. Once the progress bar indicates completion, a hello-world app is created by default.

Setup Emulator (Android Virtual Device (AVD))

To run your Android application under the emulator, you need to first create an Android Virtual Devices (AVD). An AVD models a specific device. You can create AVDs to emulate different android devices (e.g., phone/tablet, android version, screen size, and etc.).

Step 1: In Android studio, select "Tools" → AVD Manager.

Step 2: Click "Create Virtual Device".

Step 3: In "Choose a device definition" → In "Category", choose "Phone" → In "Name", choose "2.7 QVGA" (the smallest device available - you can try a bigger device later) → Next.

Step 4: In "System Image: Recommended" → Select the version with the highest API level →Click "Download" → Next.

Step 5: In "AVD Name", enter "2.7 QVGA API 27" (default) →Finish.

Running the Android Application on Emulator

Step 1: Select the "Run" menu → "Run app" → Under "Available Virtual Devices", select "2.7 QVGA API 27" → OK.

Step 2: It may take a few MINUTES to fire up the app on the emulator. You first see a Google logo → then "Android" → then the "wallpaper" → then the "Hello, world!" message.

Step 3: DO NOT CLOSE THE EMULATOR, as it really takes a long time to start. You could always re-run the app (or run a new app) on the same emulator. Try re-run the app by selecting "Run" menu → "Run app".

MOBILE APPLICATION DEVELOPMENT

PART – A

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

First, create the android application as discussed in "Create your First Android Application". Copy an image for logo and save the image in the drawable folder.

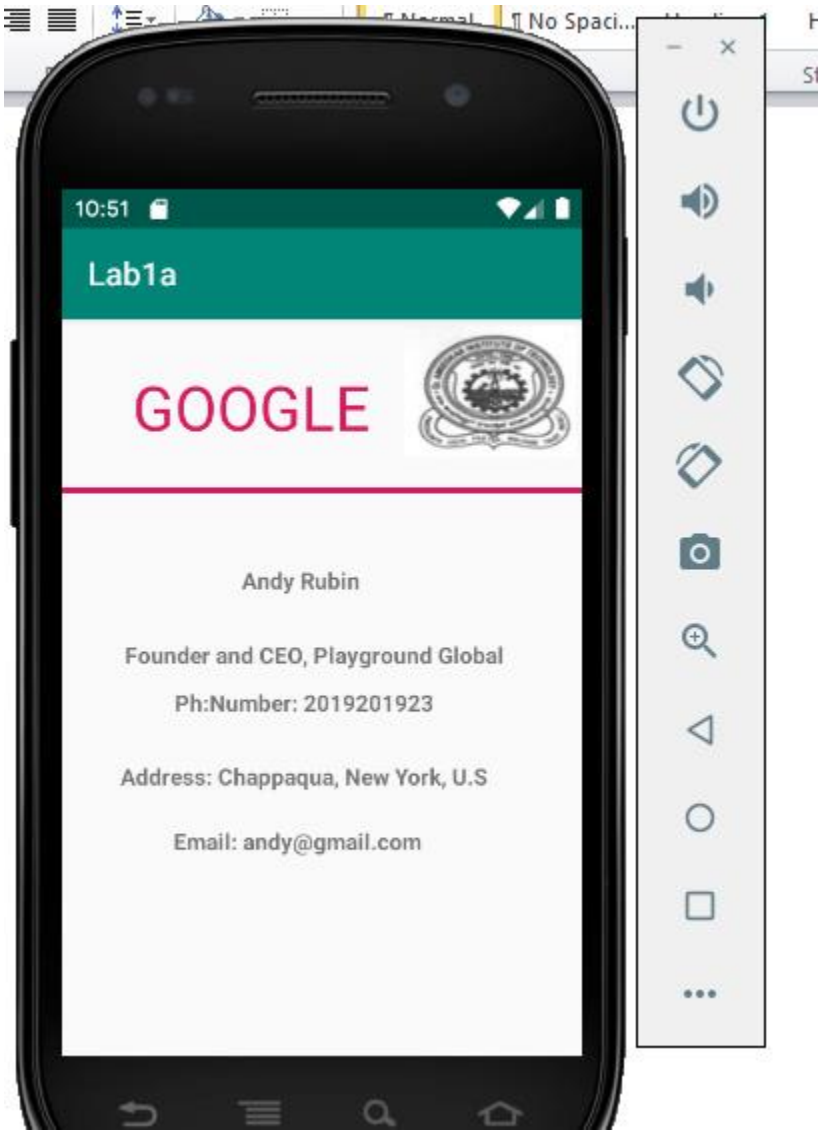
Following is the content of the modified res/layout/activity_main.xml.

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:animateLayoutChanges="true"
    tools:context=".MainActivity">


    <TextView
        android:id="@+id/textView"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="11dp"
        android:layout_marginLeft="15dp"
        android:layout_marginTop="28dp"
        android:layout_marginEnd="17dp"
        android:layout_marginRight="17dp"
        android:text="   GOOGLE"
        android:textColor="@color/colorAccent"
        android:textSize="38dp"
        app:layout_constraintEnd_toStartOf="@+id/imageView"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent" />

    <ImageView
        android:id="@+id/imageView"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginTop="4dp"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toEndOf="@+id/textView"
        app:layout_constraintTop_toTopOf="parent"
        app:srcCompat="@drawable/logo" />

    <View
        android:id="@+id/view"
        android:layout_width="wrap_content"
        android:layout_height="4dp"
        android:layout_marginTop="103dp"
        android:layout_marginBottom="498dp"
```

```
        android:background="@color/colorAccent"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.07"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />

    <TextView
        android:id="@+id/textView3"
        android:layout_width="81dp"
        android:layout_height="30dp"
        android:layout_marginBottom="16dp"
        android:text="Andy Rubin"
        android:textStyle="bold"
        app:layout_constraintBottom_toTopOf="@+id/textView4"
        app:layout_constraintEnd_toEndOf="@+id/view"
        app:layout_constraintHorizontal_bias="0.463"
        app:layout_constraintStart_toStartOf="parent" />

    <TextView
        android:id="@+id/textView4"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text="Founder and CEO, Playground Global"
        android:textStyle="bold"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.448"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.453" />

    <TextView
        android:id="@+id/textView6"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="165dp"
        android:layout_marginLeft="165dp"
        android:layout_marginTop="301dp"
        android:layout_marginEnd="187dp"
        android:layout_marginRight="187dp"
        android:layout_marginBottom="283dp"
        android:text="Ph:Number: 2019201923"
        android:textStyle="bold"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent" />

    <TextView
        android:id="@+id/textView7"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="165dp"
        android:layout_marginLeft="165dp"
        android:layout_marginTop="346dp"
        android:layout_marginEnd="187dp"
        android:layout_marginRight="187dp"
        android:layout_marginBottom="238dp"
        android:text="Address: Chappaqua, New York, U.S"
        android:textStyle="bold"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent" />
```

```
    <TextView
        android:id="@+id/textView8"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="161dp"
        android:layout_marginLeft="161dp"
        android:layout_marginTop="386dp"
        android:layout_marginEnd="191dp"
        android:layout_marginRight="191dp"
        android:layout_marginBottom="198dp"
        android:text="Email: andy@gmail.com"
        android:textStyle="bold"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent" />


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



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

First, create the android application as discussed in "Create your First Android Application". Following is the content of the modified res/layout/activity_main.xml

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/textView6"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text="SIMPLE CALCULATOR"
        android:textAlignment="center"
        android:textAllCaps="false"
        android:textSize="24sp"
        android:textStyle="bold"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.396"
        app:layout_constraintLeft_toLeftOf="parent"
        app:layout_constraintRight_toRightOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.04" />

    <TextView
        android:id="@+id/textView8"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="75dp"
        android:layout_marginTop="73dp"
        android:layout_marginEnd="277dp"
        android:layout_marginBottom="639dp"
        android:text="Results / Calculation"
        android:textColor="@color/colorAccent"
        android:textSize="18sp"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.075"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />

    <Button
        android:id="@+id/button7"
        android:layout_width="55dp"
        android:layout_height="45dp"
        android:layout_marginStart="77dp"
        android:layout_marginTop="142dp"
        android:layout_marginEnd="256dp"
```

```
        android:layout_marginBottom="541dp"
        android:text="7"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="1.0"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />

    <Button
        android:id="@+id/button8"
        android:layout_width="55dp"
        android:layout_height="45dp"
        android:layout_marginStart="47dp"
        android:layout_marginTop="142dp"
        android:layout_marginEnd="126dp"
        android:layout_marginBottom="541dp"
        android:text="8"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.368"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />

    <Button
        android:id="@+id/button9"
        android:layout_width="55dp"
        android:layout_height="45dp"
        android:layout_marginStart="147dp"
        android:layout_marginTop="142dp"
        android:layout_marginEnd="122dp"
        android:layout_marginBottom="526dp"
        android:text="9"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.0"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />

    <Button
        android:id="@+id/buttondiv"
        android:layout_width="55dp"
        android:layout_height="45dp"
        android:layout_marginStart="227dp"
        android:layout_marginTop="142dp"
        android:layout_marginEnd="125dp"
        android:layout_marginBottom="532dp"
        android:text="/"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.135"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />

    <EditText
        android:id="@+id/editText4"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="35dp"
        android:layout_marginTop="97dp"
        android:layout_marginEnd="97dp"
        android:layout_marginBottom="589dp"
        android:ems="10"
        android:inputType="number"
```

```
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.0"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />

    <Button
        android:id="@+id/button4"
        android:layout_width="55dp"
        android:layout_height="45dp"
        android:layout_marginStart="10dp"
        android:layout_marginTop="192dp"
        android:layout_marginEnd="256dp"
        android:layout_marginBottom="496dp"
        android:text="4"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="1.0"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />

    <Button
        android:id="@+id/button5"
        android:layout_width="55dp"
        android:layout_height="45dp"
        android:layout_marginStart="47dp"
        android:layout_marginTop="192dp"
        android:layout_marginEnd="126dp"
        android:layout_marginBottom="493dp"
        android:text="5"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.368"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />

    <Button
        android:id="@+id/button6"
        android:layout_width="55dp"
        android:layout_height="45dp"
        android:layout_marginStart="147dp"
        android:layout_marginTop="192dp"
        android:layout_marginEnd="126dp"
        android:layout_marginBottom="526dp"
        android:text="6"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.0"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />

    <Button
        android:id="@+id/buttonmul"
        android:layout_width="55dp"
        android:layout_height="45dp"
        android:layout_marginStart="227dp"
        android:layout_marginTop="192dp"
        android:layout_marginEnd="126dp"
        android:layout_marginBottom="532dp"
        android:text="*"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.135"
```

```
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />

    <Button
        android:id="@+id/button1"
        android:layout_width="55dp"
        android:layout_height="45dp"
        android:layout_marginStart="10dp"
        android:layout_marginTop="240dp"
        android:layout_marginEnd="256dp"
        android:layout_marginBottom="496dp"
        android:text="1"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="1.0"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />

    <Button
        android:id="@+id/button2"
        android:layout_width="55dp"
        android:layout_height="45dp"
        android:layout_marginStart="47dp"
        android:layout_marginTop="240dp"
        android:layout_marginEnd="126dp"
        android:layout_marginBottom="493dp"
        android:text="2"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.368"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />

    <Button
        android:id="@+id/button3"
        android:layout_width="55dp"
        android:layout_height="45dp"
        android:layout_marginStart="147dp"
        android:layout_marginTop="240dp"
        android:layout_marginEnd="126dp"
        android:layout_marginBottom="526dp"
        android:text="3"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.0"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />

    <Button
        android:id="@+id/buttonsub"
        android:layout_width="55dp"
        android:layout_height="45dp"
        android:layout_marginStart="227dp"
        android:layout_marginTop="240dp"
        android:layout_marginEnd="126dp"
        android:layout_marginBottom="532dp"
        android:text="-"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.135"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />
```

```
    <Button
        android:id="@+id/buttondot"
        android:layout_width="55dp"
        android:layout_height="45dp"
        android:layout_marginStart="10dp"
        android:layout_marginTop="290dp"
        android:layout_marginEnd="256dp"
        android:layout_marginBottom="496dp"
        android:text="."
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="1.0"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />

    <Button
        android:id="@+id/button0"
        android:layout_width="55dp"
        android:layout_height="45dp"
        android:layout_marginStart="47dp"
        android:layout_marginTop="290dp"
        android:layout_marginEnd="126dp"
        android:layout_marginBottom="493dp"
        android:text="0"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.368"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />

    <Button
        android:id="@+id/buttonequal"
        android:layout_width="55dp"
        android:layout_height="45dp"
        android:layout_marginStart="147dp"
        android:layout_marginTop="290dp"
        android:layout_marginEnd="126dp"
        android:layout_marginBottom="526dp"
        android:text="="
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.0"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />

    <Button
        android:id="@+id/buttonplus"
        android:layout_width="55dp"
        android:layout_height="45dp"
        android:layout_marginStart="227dp"
        android:layout_marginTop="290dp"
        android:layout_marginEnd="126dp"
        android:layout_marginBottom="532dp"
        android:text="+"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.135"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />

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

```
        android:layout_width="55dp"
        android:layout_height="45dp"
        android:layout_marginStart="227dp"
        android:layout_marginTop="340dp"
        android:layout_marginEnd="126dp"
        android:layout_marginBottom="532dp"
        android:text="C"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.135"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />

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

Following is the content of the modified main activity file src/MainActivity.java

MainActivity.java

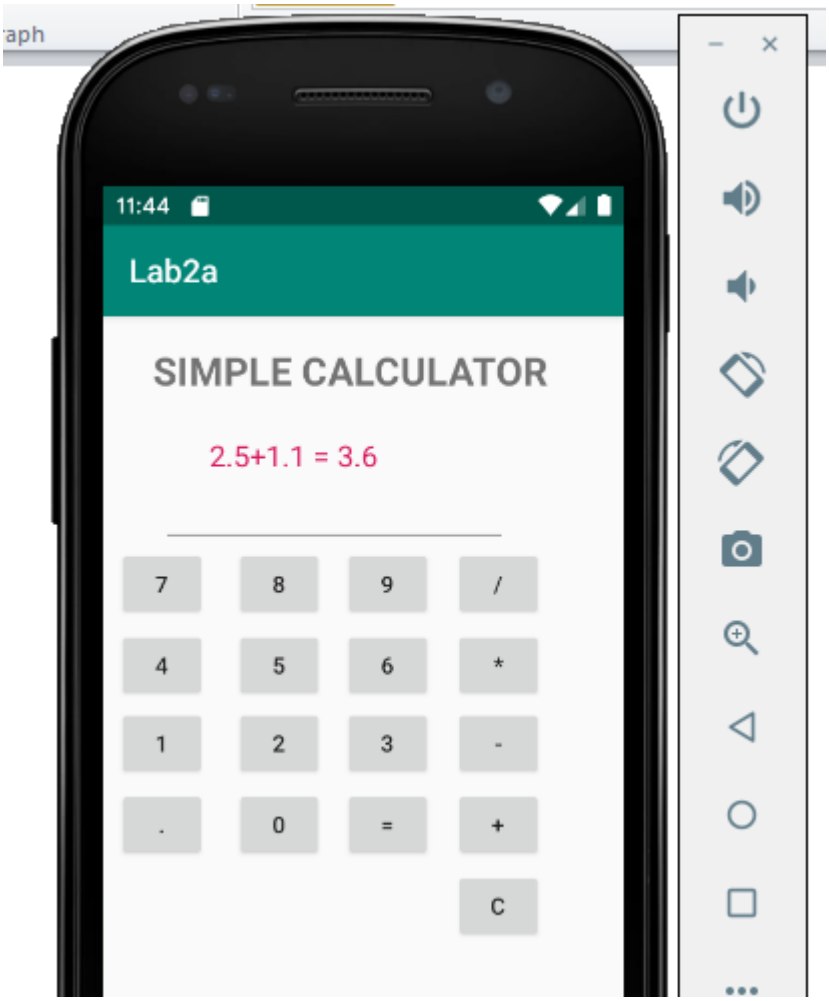
```
package com.example.lab2a;

import androidx.appcompat.app.AppCompatActivity;

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

import java.text.DecimalFormat;

public class MainActivity extends AppCompatActivity {


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

    EditText inputnum;
    TextView result;

    private double mValueOne= Double.NaN, mValueTwo;
    boolean crunchifyAddition;


    private static final char ADDITION = '+';
    private static final char SUBTRACTION = '-';
    private static final char MULTIPLICATION = '*';
    private static final char DIVISION = '/';

    private char CURRENT_ACTION;
    private DecimalFormat decimalFormat;



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

        decimalFormat = new DecimalFormat("#.##########");

        button0 = findViewById(R.id.button0);
```

```
        button1 = findViewById(R.id.button1);
        button2 = findViewById(R.id.button2);
        button3 = findViewById(R.id.button3);
        button4 = findViewById(R.id.button4);
        button5 = findViewById(R.id.button5);
        button6 = findViewById(R.id.button6);
        button7 = findViewById(R.id.button7);
        button8 = findViewById(R.id.button8);
        button9 = findViewById(R.id.button9);
        button10 = findViewById(R.id.buttondot);
        buttonAdd = findViewById(R.id.buttonplus);
        buttonSub = findViewById(R.id.buttonsub);
        buttonDivision = findViewById(R.id.buttondiv);
        buttonMul = findViewById(R.id.buttonmul);
        buttonC = findViewById(R.id.buttoncan);
        buttonEqual = findViewById(R.id.buttonequal);

        inputnum = findViewById(R.id.editText4);
        result = findViewById(R.id.textView8);

        button0.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {
                inputnum.setText(inputnum.getText() + "0");
            }
        });

        button1.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {
                inputnum.setText(inputnum.getText() + "1");
            }
        });

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

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

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

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

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

```
        });

        button7.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {
                inputnum.setText(inputnum.getText() + "7");
            }
        });

        button8.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {
                inputnum.setText(inputnum.getText() + "8");
            }
        });

        button9.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {
                inputnum.setText(inputnum.getText() + "9");
            }
        });

        button10.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {
                inputnum.setText(inputnum.getText() + ".");
            }
        });

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

                computeCalculation();
                CURRENT_ACTION = ADDITION;
                result.setText(decimalFormat.format(mValueOne) + "+");
                inputnum.setText(null);
            }
        });

        buttonSub.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {
                computeCalculation();
                CURRENT_ACTION = SUBTRACTION;
                result.setText(decimalFormat.format(mValueOne) + "-");
                inputnum.setText(null);
            }
        });

        buttonMul.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {
                computeCalculation();
                CURRENT_ACTION = MULTIPLICATION;
                result.setText(decimalFormat.format(mValueOne) + "*");
                inputnum.setText(null);
            }
        });


        buttonDivision.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {
                computeCalculation();
                CURRENT_ACTION = DIVISION;
```

```
                result.setText(decimalFormat.format(mValueOne) + "/");
                inputnum.setText(null);
            }
        });

        buttonC.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {
                if(inputnum.getText().length() > 0) {
                    CharSequence currentText = inputnum.getText();
                    inputnum.setText(currentText.subSequence(0, currentText.length()-
1));
                }
                else {
                    mValueOne = Double.NaN;
                    mValueTwo = Double.NaN;
                    inputnum.setText("");
                    result.setText("");
                }
            }
        });

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

                computeCalculation();
                result.setText(result.getText().toString() +
                        decimalFormat.format(mValueTwo) + " = " +
decimalFormat.format(mValueOne));
                mValueOne = Double.NaN;
                CURRENT_ACTION = '0';
            }
        });

    }

    private void computeCalculation()
    {
        if(!Double.isNaN(mValueOne))
        {
            mValueTwo = Double.parseDouble(inputnum.getText().toString());
            inputnum.setText(null);

            if(CURRENT_ACTION == ADDITION)
                mValueOne = this.mValueOne + mValueTwo;
            else if(CURRENT_ACTION == SUBTRACTION)
                mValueOne = this.mValueOne - mValueTwo;
            else if (CURRENT_ACTION == MULTIPLICATION)
                mValueOne = this.mValueOne * mValueTwo;
            else if (CURRENT_ACTION == DIVISION)
                mValueOne = this.mValueOne / mValueTwo;
        }
        else
        {
            try
            {
                mValueOne = Double.parseDouble(inputnum.getText().toString());
            }
            catch (Exception e)
            {

            }
        }
    }
}
```

Output:



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.

First, create the android application as discussed in "Create your First Android Application". Following is the content of the modified res/layout/activity_main.xml.

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:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="41dp"
        android:layout_marginTop="25dp"
        android:layout_marginEnd="80dp"
        android:layout_marginBottom="172dp"
        android:text="SIGN UP ACTIVITY"
        android:textColor="@color/colorAccent"
        android:textSize="28sp"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.0"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />

    <TextView
        android:id="@+id/textView2"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="22dp"
        android:layout_marginTop="98dp"
        android:layout_marginEnd="346dp"
        android:layout_marginBottom="604dp"
        android:text="Username:"
        android:textSize="18sp"
        android:textStyle="bold"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.0"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />

    <EditText
        android:id="@+id/editText3"
        android:layout_width="166dp"
        android:layout_height="39dp"
        android:layout_marginStart="124dp"
        android:layout_marginTop="88dp"
        android:layout_marginEnd="54dp"
        android:layout_marginBottom="610dp"
        android:ems="10"
        android:inputType="textPersonName"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
```

```
        app:layout_constraintHorizontal_bias="0.0"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0"/>

    <TextView
        android:id="@+id/textView3"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="22dp"
        android:layout_marginTop="148dp"
        android:layout_marginEnd="346dp"
        android:layout_marginBottom="604dp"
        android:text="Password:"
        android:textSize="18sp"
        android:textStyle="bold"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.0"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />

    <EditText
        android:id="@+id/editText1"
        android:layout_width="166dp"
        android:layout_height="39dp"
        android:layout_marginStart="124dp"
        android:layout_marginTop="138dp"
        android:layout_marginEnd="54dp"
        android:layout_marginBottom="610dp"
        android:ems="10"
        android:inputType="textPassword"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.0"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />

    <Button
        android:id="@+id/button"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="108dp"
        android:layout_marginTop="190dp"
        android:layout_marginEnd="215dp"
        android:layout_marginBottom="517dp"
        android:text="SIGN UP"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.0"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />



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

Following is the content of the modified src/MainActivity.java. After successful Sign Up activity, it moves to loginactivity.

MainActivity.java

```
package com.example.lab3a;

import androidx.appcompat.app.AppCompatActivity;

import android.content.Intent;
import android.os.Bundle;
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 {

    Button signup;
    EditText username, password;

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


        username = findViewById(R.id.editText3);
        password = findViewById(R.id.editText1);

        signup = findViewById(R.id.button);

        signup.setOnClickListener(new View.OnClickListener() {

            @Override
            public void onClick(View view) {

                if(password.getText().toString().length()>=8 &&
validatePassword(password.getText().toString())){
                    Toast.makeText(getBaseContext(),"Successful Sign
UP",Toast.LENGTH_LONG).show();
                    Intent it = new Intent(getBaseContext(), login_activity.class);

                    Bundle b = new Bundle();
                    b.putString("usern",username.getText().toString());
                    b.putString("pass",password.getText().toString());
                    it.putExtras(b);

                    startActivity(it);

                }else{
                    Toast.makeText(getBaseContext(),"not
VALID",Toast.LENGTH_LONG).show();
                }



            }
        });
    }

    public boolean validatePassword(String password){
        Pattern pattern;
        Matcher matcher;
        final String PASSWORD_PATTERN = "^(?=.*[0-9])(?=.*[A-Z])(?=.*[a-
z])(?=.*[@#$%^&+=!])(?=\\S+$).{8,}$";
        pattern = Pattern.compile(PASSWORD_PATTERN);
        matcher = pattern.matcher(password);

        return matcher.matches();
```

```
    }
}
```

Following is the content of res/layout/login_activity.xml. After successful login activtity it moves to success activity.

login_activity.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:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="41dp"
        android:layout_marginTop="25dp"
        android:layout_marginEnd="80dp"
        android:layout_marginBottom="172dp"
        android:text="LOGIN ACTIVITY"
        android:textColor="@color/colorAccent"
        android:textSize="28sp"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.0"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />

    <TextView
        android:id="@+id/textView2"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="22dp"
        android:layout_marginTop="98dp"
        android:layout_marginEnd="346dp"
        android:layout_marginBottom="604dp"
        android:text="Username:"
        android:textSize="18sp"
        android:textStyle="bold"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.0"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />

    <EditText
        android:id="@+id/l_username"
        android:layout_width="166dp"
        android:layout_height="39dp"
        android:layout_marginStart="124dp"
        android:layout_marginTop="88dp"
        android:layout_marginEnd="54dp"
        android:layout_marginBottom="610dp"
        android:ems="10"
        android:inputType="textPersonName"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.0"
        app:layout_constraintStart_toStartOf="parent"
```

```
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0"/>

    <TextView
        android:id="@+id/textView3"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="22dp"
        android:layout_marginTop="148dp"
        android:layout_marginEnd="346dp"
        android:layout_marginBottom="604dp"
        android:text="Password:"
        android:textSize="18sp"
        android:textStyle="bold"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.0"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />

    <EditText
        android:id="@+id/l_password"
        android:layout_width="166dp"
        android:layout_height="39dp"
        android:layout_marginStart="124dp"
        android:layout_marginTop="138dp"
        android:layout_marginEnd="54dp"
        android:layout_marginBottom="610dp"
        android:ems="10"
        android:inputType="textPassword"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.0"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />

    <Button
        android:id="@+id/button_signin"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="108dp"
        android:layout_marginTop="190dp"
        android:layout_marginEnd="215dp"
        android:layout_marginBottom="517dp"
        android:text="SIGN IN"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.0"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />



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

login_activity.java

```
package com.example.lab3a;

import androidx.appcompat.app.AppCompatActivity;

import android.content.Intent;
```

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

public class login_activity extends AppCompatActivity {

    Button lsignin;
    EditText lusername, lpassword;

    int counter = 2;

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

        lusername = findViewById(R.id.l_username);
        lpassword = findViewById(R.id.l_password);

        lsignin = findViewById(R.id.button_signin);

        lsignin.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {

                Bundle b = getIntent().getExtras();
                String suser = b.getString("usern");
                String spass = b.getString("pass");

               if(suser.toString().equals(lusername.getText().toString()) &&
spass.toString().equals(lpassword.getText().toString()))
                {
                    Intent it = new Intent(getBaseContext(), success.class);
                    startActivity(it);
                }
                else
                {
                    Toast.makeText(getBaseContext(),"LOGIN
FAILED",Toast.LENGTH_LONG).show();
                }

                counter--;

                if(counter == 0)
                {
                    Toast.makeText(getBaseContext(),"FAILED LOGIN
ATTEMPTS",Toast.LENGTH_LONG).show();
                    lsignin.setEnabled(false);
                }
            }
        });


    }
}
```

success.xml

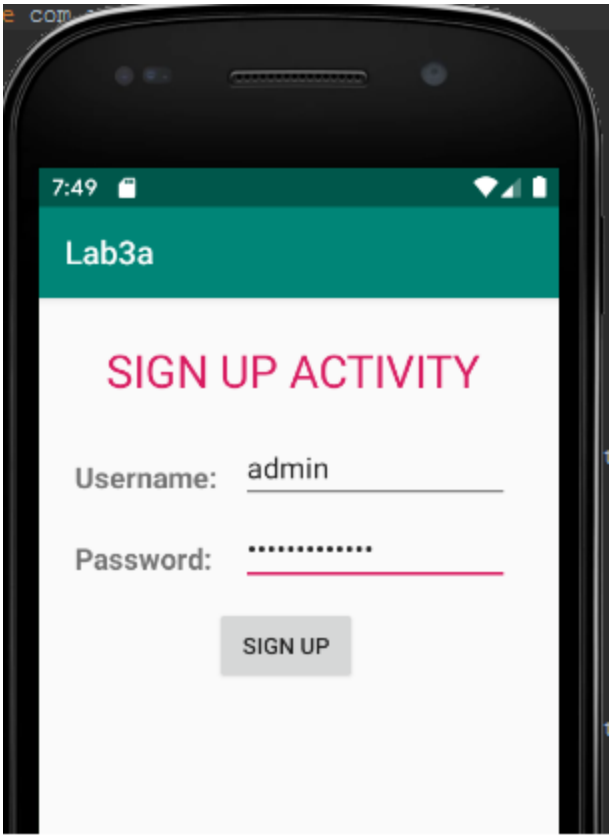
```
<?xml version="1.0" encoding="utf-8"?>
<androidx.constraintlayout.widget.ConstraintLayout
xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools"
```

```
    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_marginStart="163dp"
        android:layout_marginTop="300dp"
        android:layout_marginEnd="189dp"
        android:layout_marginBottom="412dp"
        android:text="SUCCESSFULL LOGIN"
        android:textColor="@color/colorAccent"
        android:textSize="30sp"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent" />
</androidx.constraintlayout.widget.ConstraintLayout>
```

success.java

```
package com.example.lab3a;

import androidx.appcompat.app.AppCompatActivity;

import android.os.Bundle;

public class success extends AppCompatActivity {

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

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.

First, create the android application as discussed in "Create your First Android Application". Copy the images and save the images in the drawable folder. Following is the content of the modified res/layout/activity_main.xml.

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:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text="CHANGING WALLPAPER APPLICATION"
        android:textColor="@color/colorAccent"
        android:textStyle="bold"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
```

```
        app:layout_constraintHorizontal_bias="0.496"
        app:layout_constraintLeft_toLeftOf="parent"
        app:layout_constraintRight_toRightOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.063" />

    <Button
        android:id="@+id/button"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="72dp"
        android:layout_marginTop="53dp"
        android:layout_marginEnd="35dp"
        android:layout_marginBottom="590dp"
        android:text="CLICK HERE TO CHANGE WALLPAPER"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.820"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />

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

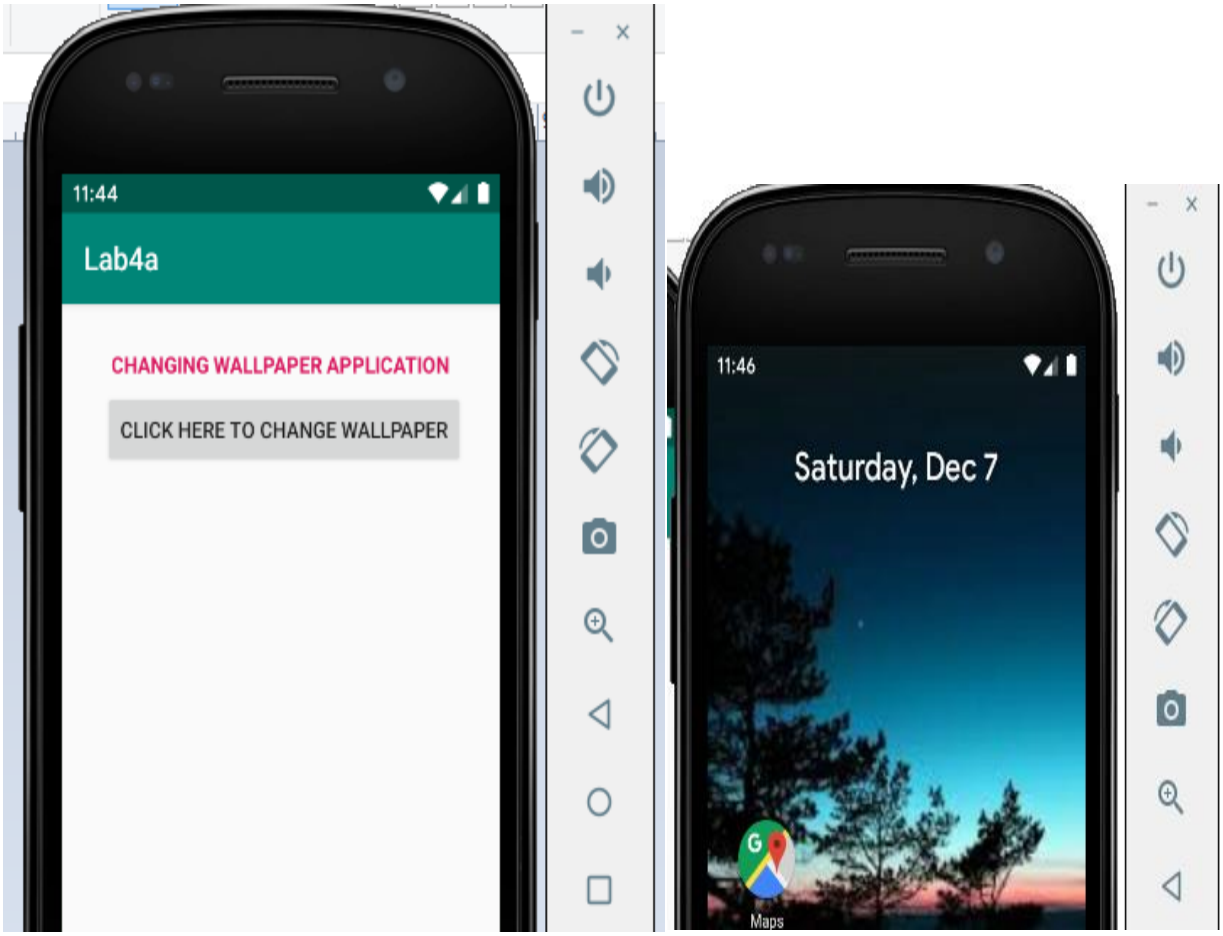
Save five images (jpg format) in the drawable folder. In this example one.jpg, two.jpg,three.jpg, four.jpg and five.jpg images are saved in drawable folder.

MainActivity.java

```
package com.example.lab4a;

import androidx.appcompat.app.AppCompatActivity;

import android.app.WallpaperManager;
import android.graphics.Bitmap;
import android.graphics.BitmapFactory;
import android.graphics.drawable.AnimationDrawable;
import android.graphics.drawable.BitmapDrawable;
import android.graphics.drawable.Drawable;
import android.os.Bundle;
import android.view.View;
import android.widget.Button;
import android.widget.Toast;

import java.io.IOException;
import java.util.Timer;
import java.util.TimerTask;

public class MainActivity extends AppCompatActivity {


    Button changewallpaper;
    Timer mytimer;
    Drawable drawable;
    WallpaperManager wpm;
    int prev=1;


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

```
        mytimer = new Timer();
        wpm = WallpaperManager.getInstance(this);

        changewallpaper = findViewById(R.id.button);

        changewallpaper.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {

                setWallpaper();
            }
        });
    }

    private void setWallpaper()
    {

        mytimer.schedule(new TimerTask() {
            @Override
            public void run() {
                if(prev==1) {
                    drawable = getResources().getDrawable(R.drawable.one);
                    prev = 2;
                }
                else if(prev==2) {
                    drawable = getResources().getDrawable(R.drawable.two);
                    prev=3;
                }
                else if(prev==3) {
                    drawable = getResources().getDrawable(R.drawable.three);
                    prev=4;
                }
                else if(prev==4) {
                    drawable = getResources().getDrawable(R.drawable.four);
                    prev=5;
                }
                else if(prev==5) {
                    drawable = getResources().getDrawable(R.drawable.five);
                    prev=1;
                }

                Bitmap wallpaper = ((BitmapDrawable)drawable).getBitmap();

                try {
                    wpm.setBitmap(wallpaper);
                }
                catch (IOException e) {
                    e.printStackTrace();
                }
            }
        },0,30000);
    }
}
```

Output:



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 TextView control.

First, create the android application as discussed in "Create your First Android Application". Following is the content of the modified res/layout/activity_main.xml.

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:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text="COUNTER APPLICATION"
        android:textColor="@color/colorAccent"
        android:textSize="18sp"
```

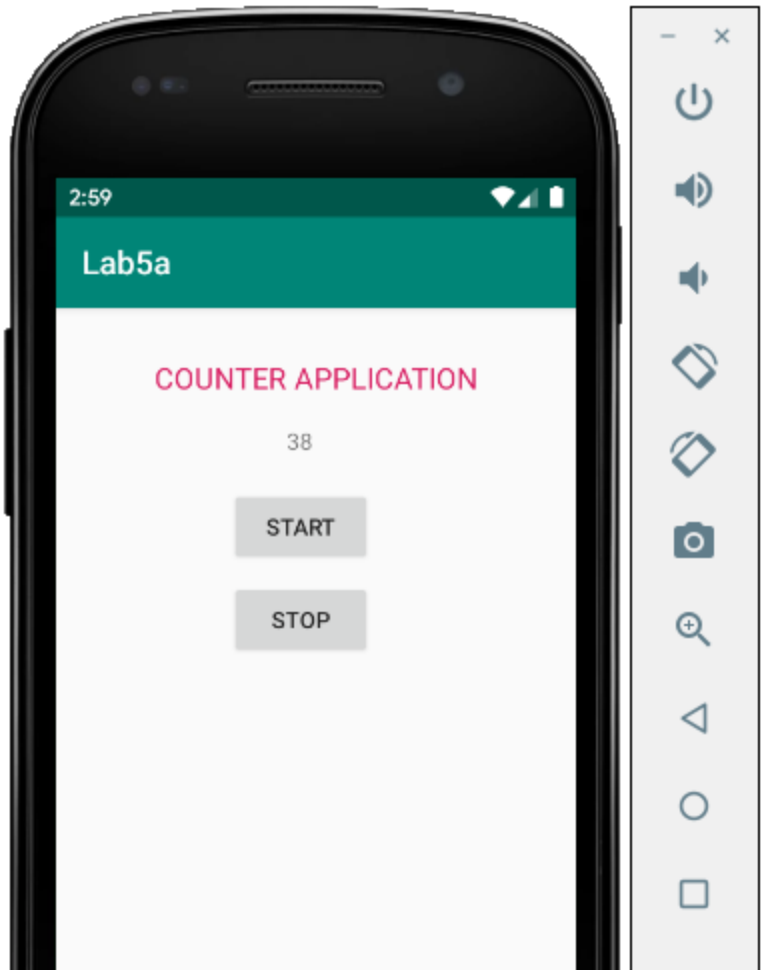
```
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.498"
        app:layout_constraintLeft_toLeftOf="parent"
        app:layout_constraintRight_toRightOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.071" />

    <TextView
        android:id="@+id/textView1"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="60dp"
        android:layout_marginTop="90dp"
        android:layout_marginEnd="79dp"
        android:layout_marginBottom="596dp"
        android:text="Counter Value"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.498"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.071" />

    <Button
        android:id="@+id/btn_start"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="152dp"
        android:layout_marginTop="129dp"
        android:layout_marginEnd="171dp"
        android:layout_marginBottom="542dp"
        android:text="START"
        app:layout_constraintHorizontal_bias="0.498"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.071"/>

    <Button
        android:id="@+id/btn_stop"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="152dp"
        android:layout_marginTop="191dp"
        android:layout_marginEnd="171dp"
        android:layout_marginBottom="542dp"
        android:text="STOP"
        app:layout_constraintHorizontal_bias="0.498"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.071"/>

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

Following is the content of the modified src/MainActivity.java.

MainActivity.java

```
package com.example.lab5a;

import androidx.appcompat.app.AppCompatActivity;

import android.os.Bundle;


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

public class MainActivity extends AppCompatActivity {

    Button btnstart, btnstop;
    TextView txtcounter;

    int i = 1;
    long startTime, timeInMilliseconds = 0;
    Handler customHandler = new Handler();


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

        txtcounter = findViewById(R.id.textView1);


        btnstart = findViewById(R.id.btn_start);
        btnstop = findViewById(R.id.btn_stop);

        btnstart.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {

                customHandler.postDelayed(updateTimerThread,0);
            }
        });


        btnstop.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {

                customHandler.removeCallbacks(updateTimerThread);
            }
        });
    }

    private Runnable updateTimerThread = new Runnable() {
        @Override
        public void run() {
            txtcounter.setText(""+i);
            customHandler.postDelayed(this,1000);
            i++;
        }
    };
}
```

Output:



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.

First, create the android application as discussed in "Create your First Android Application". Following is the content of the modified res/layout/activity_main.xml.

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:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text="PARSING XML AND JSON DATA"
```

```
        android:textColor="@color/colorAccent"
        android:textSize="18sp"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.496"
        app:layout_constraintLeft_toLeftOf="parent"
        app:layout_constraintRight_toRightOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.059" />

    <Button
        android:id="@+id/buttonxml"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="40dp"
        android:layout_marginTop="90dp"
        android:layout_marginEnd="33dp"
        android:layout_marginBottom="574dp"
        android:text="Parse XML Data"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.490"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.05" />

    <Button
        android:id="@+id/buttonjson"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="40dp"
        android:layout_marginTop="150dp"
        android:layout_marginEnd="33dp"
        android:layout_marginBottom="574dp"
        android:text="Parse JSON Data"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.490"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.05" />

    <TextView
        android:id="@+id/display_result"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="40dp"
        android:layout_marginTop="550dp"
        android:layout_marginEnd="33dp"
        android:layout_marginBottom="674dp"
        android:text="Display Results"
        android:textStyle="bold"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.483"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.4" />

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

Following is the content of the modified src/MainActivity.java.

MainActivity.java

```
package com.example.lab6a;

import androidx.appcompat.app.AppCompatActivity;

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

import org.json.JSONArray;
import org.json.JSONException;
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 java.util.ArrayList;

import javax.xml.parsers.DocumentBuilder;
import javax.xml.parsers.DocumentBuilderFactory;

public class MainActivity extends AppCompatActivity {

    ArrayList<String> numberlist = new ArrayList<>();
    Button parsexml, parsejson;
    TextView displayResult;

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


        displayResult = findViewById(R.id.display_result);

        parsexml = findViewById(R.id.buttonxml);
        parsejson = findViewById(R.id.buttonjson);


        parsexml.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {
                try {
                    InputStream is = getAssets().open("city.xml");

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

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

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

                    displayResult.setText(" ");
                    for (int i = 0; i < nList.getLength(); i++) {
```

```
                        Node node = nList.item(i);
                        if (node.getNodeType() == Node.ELEMENT_NODE) {
                            Element element2 = (Element) node;

                            displayResult.setText(displayResult.getText() + "\n Name :
" + getValue("name", element2) + "\n");
                            displayResult.setText(displayResult.getText() + " Latitude
: " + getValue("lat", element2) + "\n");
                            displayResult.setText(displayResult.getText() + "
Longitude : " + getValue("long", element2) + "\n");
                            displayResult.setText(displayResult.getText() + "
Temperature : " + getValue("temperature", element2) + "\n");
                            displayResult.setText(displayResult.getText() + " Humidity
: " + getValue("humidity", element2) + "\n");
                            displayResult.setText(displayResult.getText() + "---------
-------------- ");
                        }
                    }
                }
                catch (Exception e)
                {
                    e.printStackTrace();
                }
            }

        });

        parsejson.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {
                String json;

                try
                {
                        InputStream is = getAssets().open("example.json");
                        int size = is.available();
                        byte[] buffer = new byte[size];
                        is.read(buffer);
                        is.close();

                        json = new String(buffer,"UTF-8");
                        JSONArray jsonArray = new JSONArray(json);

                        displayResult.setText(" ");

                        for(int i = 0; i<jsonArray.length(); i++)
                        {
                            JSONObject obj = jsonArray.getJSONObject(i);
                            displayResult.setText(displayResult.getText() + "\n Name :
" + obj.getString("name") + "\n");
                            displayResult.setText(displayResult.getText() + " Latitude
: " + obj.getString("lat") + "\n");
                            displayResult.setText(displayResult.getText() + "
Longitude : " + obj.getString("long") + "\n");
                            displayResult.setText(displayResult.getText() + "
Temperature : " + obj.getString("temperature") + "\n");
                            displayResult.setText(displayResult.getText() + " Humidity
: " + obj.getString("humidity") + "\n");
                            displayResult.setText(displayResult.getText() +
"********************** ");
                        }

                }
                catch(IOException e)
                {
                    e.printStackTrace();
                }
```

```
                catch (JSONException e)
                {
                    e.printStackTrace();
                }

            }
        });

    }

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

Navigate to the Project Option. Click on app → scr → main folder. Right click on main → new → Directory. Create a new directory named assets. Create a file example.json in the assets folder. Following is the content of the file assets/example.json

example.json

```
[
  {
    "name": "Mysore ",
    "lat": "12.295 ",
    "long": "76.639 ",
    "temperature":"22 ",
    "humidity": "92 %"
  },
  {
    "name": "Bangalore",
    "lat": "12.97165 ",
    "long": "77.5946 ",
    "temperature":"25 ",
    "humidity": "74 %"
  }
]
```

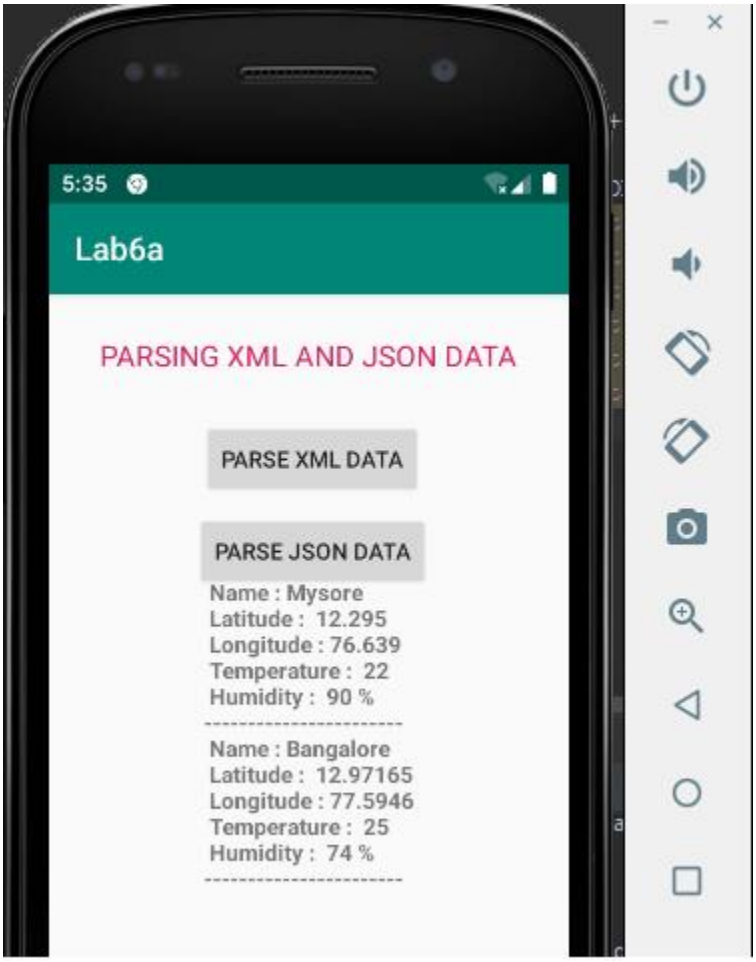
Create a file city.xml in the assets folder. Following is the content of the file assets/city.xml

city.xml

```
<?xml version="1.0"?>
<records>
<place>
    <name>Mysore</name>
    <lat> 12.295 </lat>
    <long>76.639 </long>
    <temperature> 22 </temperature>
    <humidity> 90 % </humidity>
</place>

    <place>
        <name>Bangalore</name>
        <lat> 12.97165 </lat>
        <long>77.5946 </long>
        <temperature> 25 </temperature>
        <humidity> 74 % </humidity>
```

```
    </place>

</records>
```

Output:



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.

First, create the android application as discussed in "Create your First Android Application". Following is the content of the modified res/layout/activity_main.xml.

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:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text="TEXT TO SPEECH APPLICATION"
        android:textColor="@color/colorAccent"
        android:textSize="18sp"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.498"
        app:layout_constraintLeft_toLeftOf="parent"
        app:layout_constraintRight_toRightOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.071"     />

    <EditText
        android:id="@+id/txt_input"
        android:layout_width="237dp"
        android:layout_height="177dp"
        android:layout_marginStart="100dp"
        android:layout_marginTop="209dp"
        android:layout_marginEnd="77dp"
        android:layout_marginBottom="437dp"
        android:inputType="textMultiLine"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent" />

    <Button
        android:id="@+id/btn_txt2spch"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="75dp"
        android:layout_marginTop="399dp"
        android:layout_marginEnd="51dp"
        android:layout_marginBottom="284dp"
        android:text="Convert Text to Speech"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent" />


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

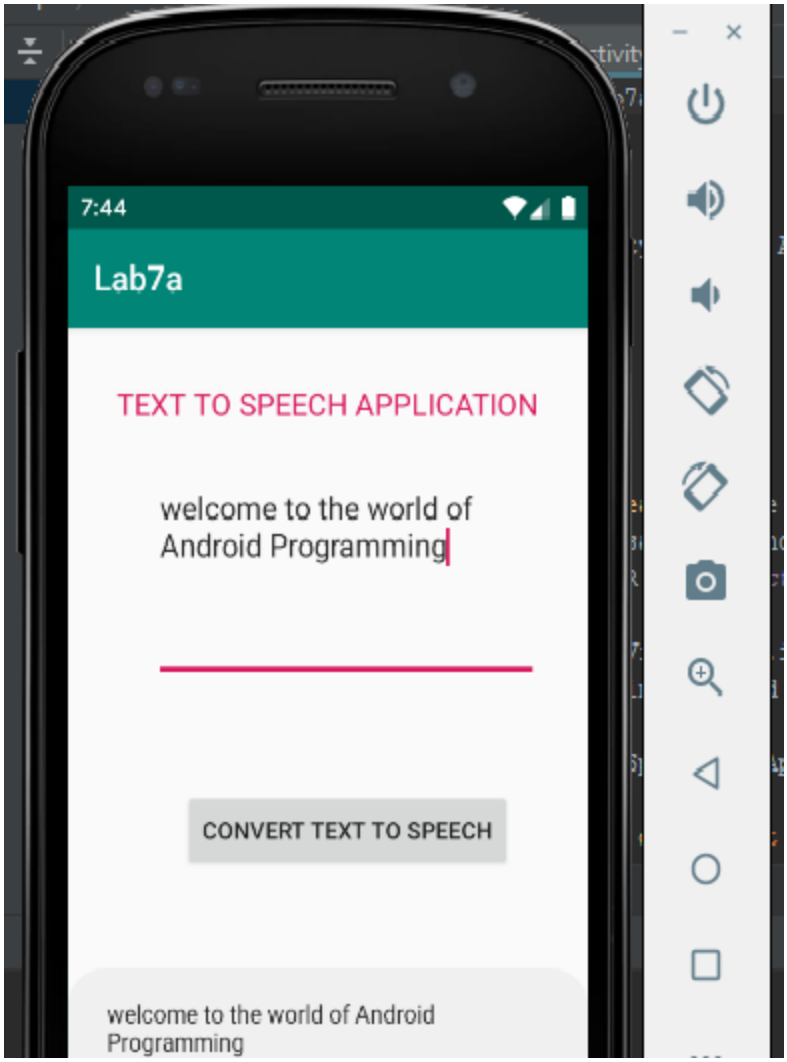
Following is the content of the modified src/MainActivity.java

MainActivity.java

```
package com.example.lab7a;

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;

import java.util.Locale;

public class MainActivity extends AppCompatActivity {
```

```
    TextToSpeech t1;
    EditText txtinput;
    Button txttospeech;

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

        txtinput = findViewById(R.id.txt_input);
        txttospeech = findViewById(R.id.btn_txt2spch);

        t1 = new TextToSpeech(getApplicationContext(), new
TextToSpeech.OnInitListener() {
            @Override
            public void onInit(int status) {
                if(status != TextToSpeech.ERROR) {
                    t1.setLanguage(Locale.UK);
                }
            }
        });

        txttospeech.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {
                String tospeak = txtinput.getText().toString();
                Toast.makeText(getBaseContext(),tospeak,Toast.LENGTH_SHORT).show();

                t1.speak(tospeak,TextToSpeech.QUEUE_FLUSH,null);
            }
        });
    }

    public void onPause()
    {
        if(t1 != null)
        {
            t1.stop();
            t1.shutdown();
        }
        super.onPause();
    }
}
```

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.

First, create the android application as discussed in "Create your First Android Application". Following is the content of the modified res/layout/activity_main.xml.

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:text="CALL AND SAVE APPLICATION"
```

```
        android:textAlignment="center"
        android:textAllCaps="false"
        android:textColor="@color/colorAccent"
        android:textSize="18sp"
        android:textStyle="bold"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.396"
        app:layout_constraintLeft_toLeftOf="parent"
        app:layout_constraintRight_toRightOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.04" />


    <EditText
        android:id="@+id/editText"
        android:layout_width="155dp"
        android:layout_height="wrap_content"
        android:layout_marginStart="35dp"
        android:layout_marginTop="57dp"
        android:layout_marginEnd="97dp"
        android:layout_marginBottom="589dp"
        android:ems="5"
        android:inputType="number"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.0"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />

    <Button
        android:id="@+id/buttondel"
        android:layout_width="55dp"
        android:layout_height="45dp"
        android:layout_marginStart="227dp"
        android:layout_marginTop="57dp"
        android:layout_marginEnd="125dp"
        android:layout_marginBottom="532dp"
        android:text="DEL"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.135"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />


    <Button
        android:id="@+id/button1"
        android:layout_width="55dp"
        android:layout_height="45dp"
        android:layout_marginStart="35dp"
        android:layout_marginTop="122dp"
        android:layout_marginEnd="256dp"
        android:layout_marginBottom="541dp"
        android:text="1"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.0"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />

    <Button
        android:id="@+id/button2"
```

```
        android:layout_width="55dp"
        android:layout_height="45dp"
        android:layout_marginStart="73dp"
        android:layout_marginTop="122dp"
        android:layout_marginEnd="126dp"
        android:layout_marginBottom="541dp"
        android:text="2"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.368"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />

    <Button
        android:id="@+id/button3"
        android:layout_width="55dp"
        android:layout_height="45dp"
        android:layout_marginStart="157dp"
        android:layout_marginTop="122dp"
        android:layout_marginEnd="122dp"
        android:layout_marginBottom="526dp"
        android:text="3"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.0"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />

    <Button
        android:id="@+id/button4"
        android:layout_width="55dp"
        android:layout_height="45dp"
        android:layout_marginStart="35dp"
        android:layout_marginTop="172dp"
        android:layout_marginEnd="256dp"
        android:layout_marginBottom="541dp"
        android:text="4"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.0"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />

    <Button
        android:id="@+id/button5"
        android:layout_width="55dp"
        android:layout_height="45dp"
        android:layout_marginStart="73dp"
        android:layout_marginTop="172dp"
        android:layout_marginEnd="126dp"
        android:layout_marginBottom="541dp"
        android:text="5"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.368"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />

    <Button
        android:id="@+id/button6"
        android:layout_width="55dp"
        android:layout_height="45dp"
        android:layout_marginStart="157dp"
```

```
        android:layout_marginTop="172dp"
        android:layout_marginEnd="122dp"
        android:layout_marginBottom="526dp"
        android:text="6"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.0"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />

    <Button
        android:id="@+id/button7"
        android:layout_width="55dp"
        android:layout_height="45dp"
        android:layout_marginStart="35dp"
        android:layout_marginTop="222dp"
        android:layout_marginEnd="256dp"
        android:layout_marginBottom="541dp"
        android:text="7"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.0"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />

    <Button
        android:id="@+id/button8"
        android:layout_width="55dp"
        android:layout_height="45dp"
        android:layout_marginStart="73dp"
        android:layout_marginTop="222dp"
        android:layout_marginEnd="126dp"
        android:layout_marginBottom="541dp"
        android:text="8"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.368"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />

    <Button
        android:id="@+id/button9"
        android:layout_width="55dp"
        android:layout_height="45dp"
        android:layout_marginStart="157dp"
        android:layout_marginTop="222dp"
        android:layout_marginEnd="122dp"
        android:layout_marginBottom="526dp"
        android:text="9"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.0"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />

    <Button
        android:id="@+id/buttonstar"
        android:layout_width="55dp"
        android:layout_height="45dp"
        android:layout_marginStart="35dp"
        android:layout_marginTop="272dp"
        android:layout_marginEnd="256dp"
        android:layout_marginBottom="541dp"
```

```
        android:text="*"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.0"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />

    <Button
        android:id="@+id/button0"
        android:layout_width="55dp"
        android:layout_height="45dp"
        android:layout_marginStart="73dp"
        android:layout_marginTop="272dp"
        android:layout_marginEnd="126dp"
        android:layout_marginBottom="541dp"
        android:text="0"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.368"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />

    <Button
        android:id="@+id/buttonhash"
        android:layout_width="55dp"
        android:layout_height="45dp"
        android:layout_marginStart="157dp"
        android:layout_marginTop="272dp"
        android:layout_marginEnd="122dp"
        android:layout_marginBottom="526dp"
        android:text="#"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.0"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />


    <Button
        android:id="@+id/buttoncall"
        android:layout_width="80dp"
        android:layout_height="45dp"
        android:layout_marginStart="38dp"
        android:layout_marginTop="322dp"
        android:layout_marginEnd="122dp"
        android:layout_marginBottom="526dp"
        android:text="CALL"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.0"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />

    <Button
        android:id="@+id/buttonsave"
        android:layout_width="80dp"
        android:layout_height="45dp"
        android:layout_marginStart="127dp"
        android:layout_marginTop="322dp"
        android:layout_marginEnd="122dp"
        android:layout_marginBottom="526dp"
        android:text="SAVE"
        app:layout_constraintBottom_toBottomOf="parent"
```

```
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.0"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />

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

Following is the content of the modified src/MainActivity.java.

MainActivity.java

```
package com.example.lab8a;

import androidx.annotation.NonNull;
import androidx.appcompat.app.AppCompatActivity;

import android.Manifest;
import android.content.Intent;
import android.content.pm.PackageManager;
import android.net.Uri;
import android.os.Build;
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 {


    Button btn1, btn2, btn3, btn4, btn5, btn6, btn7;
    Button btn0, btn8, btn9, btnstar, btnhash, btndelete, btncall, btnsave;

    EditText txtnumber;
    int pid = 1;

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

        txtnumber = findViewById(R.id.editText);

        btn1 = findViewById(R.id.button1);
        btn2 = findViewById(R.id.button2);
        btn3 = findViewById(R.id.button3);
        btn4 = findViewById(R.id.button4);
        btn5 = findViewById(R.id.button5);
        btn6 = findViewById(R.id.button6);
        btn7 = findViewById(R.id.button7);
        btn8 = findViewById(R.id.button8);
        btn9 = findViewById(R.id.button9);
        btn0 = findViewById(R.id.button0);

        btncall = findViewById(R.id.buttoncall);
        btnsave = findViewById(R.id.buttonsave);
        btnstar = findViewById(R.id.buttonstar);
        btnhash = findViewById(R.id.buttonhash);
        btndelete = findViewById(R.id.buttondel);

        btn0.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {
```

```
                txtnumber.append("0");
            }
        });

        btn1.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {
                txtnumber.append("1");
            }
        });

        btn2.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {
                txtnumber.append("2");
            }
        });
        btn3.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {
                txtnumber.append("3");
            }
        });
        btn4.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {
                txtnumber.append("4");
            }
        });
        btn5.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {
                txtnumber.append("5");
            }
        });
        btn6.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {
                txtnumber.append("6");
            }
        });
        btn7.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {
                txtnumber.append("7");
            }
        });
        btn8.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {
                txtnumber.append("8");
            }
        });
        btn9.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {
                txtnumber.append("9");
            }
        });
        btnstar.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {
                txtnumber.append("*");
            }
        });
        btnhash.setOnClickListener(new View.OnClickListener() {
            @Override
```

```
            public void onClick(View view) {
                txtnumber.append("#");
            }
        });
        btndelete.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {
                String num = txtnumber.getText().toString();
                if (num.length() > 0) {
                    num = num.substring(0, num.length() - 1);
                }
                txtnumber.setText(num);
            }
        });

        btncall.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {
                callatruntimepermission();
            }
            });

        btnsave.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {
                String num = txtnumber.getText().toString();
                Intent it = new Intent(Intent.ACTION_INSERT,
ContactsContract.Contacts.CONTENT_URI);
                it.putExtra(ContactsContract.Intents.Insert.PHONE,num);
                startActivity(it);
            }
        });
    }

    private void callatruntimepermission()
    {
        if(Build.VERSION.SDK_INT >= Build.VERSION_CODES.M &&
checkSelfPermission(Manifest.permission.CALL_PHONE) !=
PackageManager.PERMISSION_GRANTED)
        {
            requestPermissions(new String[]{Manifest.permission.CALL_PHONE},pid);

        }
        else
        {
                String num = txtnumber.getText().toString();
                Intent it = new Intent(Intent.ACTION_CALL);
                it.setData(Uri.parse("tel:" + num));
            startActivity(it);
        }

    }

    public  void onRequestPermissionResult(int requestCode, @NonNull
String[]permissions,@NonNull int[] grantResult)
    {
        super.onRequestPermissionsResult(requestCode,permissions,grantResult);

        if(requestCode==pid)
        {
            if(grantResult[0]==PackageManager.PERMISSION_GRANTED)
            {
                callatruntimepermission();
            }
        }
    }
```

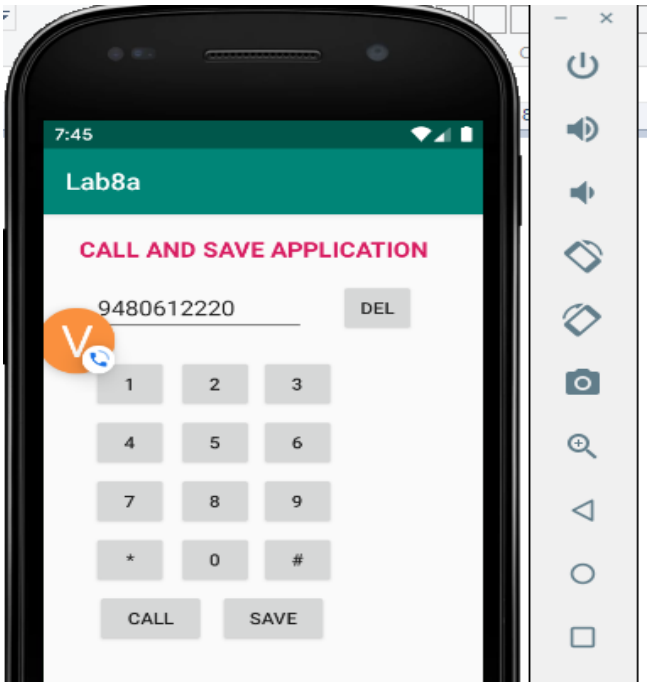
```
}
```

Following is the uses-permission added to the AndroidManifest.xml.

AndroidManifest.xml

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

Output:



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.

First, create the android application as discussed in "Create your First Android Application". On pressing the "Insert Data into the Database" Button it moves to the insertdata activity and on pressing the "Trigger an Alarm" it moves to the triggeralarm activity. Following is the content of the modified res/layout/activity_main.xml.

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:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text="MEDICINE DATABASE"
        android:textColor="@color/colorAccent"
        android:textSize="18sp"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.498"
        app:layout_constraintLeft_toLeftOf="parent"
        app:layout_constraintRight_toRightOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.071" />

    <Button
        android:id="@+id/btn_insert"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="152dp"
        android:layout_marginTop="129dp"
        android:layout_marginEnd="171dp"
        android:layout_marginBottom="542dp"
        android:text="INSERT DATA INTO THE DATABASE"
        app:layout_constraintHorizontal_bias="0.498"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.071"
        android:layout_marginLeft="152dp"
        android:layout_marginRight="171dp" />

    <Button
        android:id="@+id/btn_trigger"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="152dp"
        android:layout_marginTop="191dp"
        android:layout_marginEnd="171dp"
        android:layout_marginBottom="542dp"
        android:text="TRIGGER AN ALARM"
        app:layout_constraintHorizontal_bias="0.498"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.071"
        android:layout_marginLeft="152dp"
        android:layout_marginRight="171dp" />

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

Following is the content of the res/layout/activity_insertdata.xml.

activity_insertdata.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:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text="MEDICINE DATABASE"
        android:textColor="@color/colorAccent"
        android:textSize="24sp"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintHorizontal_bias="0.452"
        app:layout_constraintLeft_toLeftOf="parent"
        app:layout_constraintRight_toRightOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.071" />

    <TextView
        android:id="@+id/textView"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="71dp"
        android:layout_marginTop="112dp"
        android:layout_marginEnd="238dp"
        android:layout_marginBottom="600dp"
        android:text="Medicine Name:"
        android:textSize="18sp"
        android:textStyle="bold"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.452"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.071"
        android:layout_marginLeft="71dp"
        android:layout_marginRight="238dp" />

    <EditText
        android:id="@+id/editText"
        android:layout_width="130dp"
        android:layout_height="wrap_content"
        android:layout_marginStart="211dp"
        android:layout_marginTop="99dp"
        android:layout_marginEnd="100dp"
        android:layout_marginBottom="587dp"
        android:ems="10"
        android:inputType="text"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.452"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.071"
        android:layout_marginLeft="211dp"
        android:layout_marginRight="100dp" />


    <TextView
        android:id="@+id/textView1"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="10dp"
        android:layout_marginTop="159dp"
        android:layout_marginEnd="238dp"
        android:layout_marginBottom="600dp"
        android:text="Date:"
```

```
        android:textSize="18sp"
        android:textStyle="bold"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.452"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.071"
        android:layout_marginLeft="10dp"
        android:layout_marginRight="238dp" />

    <EditText
        android:id="@+id/editText1"
        android:layout_width="130dp"
        android:layout_height="wrap_content"
        android:layout_marginStart="211dp"
        android:layout_marginTop="149dp"
        android:layout_marginEnd="100dp"
        android:layout_marginBottom="587dp"
        android:ems="10"
        android:inputType="text"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.452"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.071"
        android:layout_marginLeft="211dp"
        android:layout_marginRight="100dp" />

    <TextView
        android:id="@+id/textView2"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="71dp"
        android:layout_marginTop="219dp"
        android:layout_marginEnd="238dp"
        android:layout_marginBottom="600dp"
        android:text="Time of the Day:"
        android:textSize="18sp"
        android:textStyle="bold"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.452"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.071"
        android:layout_marginLeft="71dp"
        android:layout_marginRight="238dp" />

    <EditText
        android:id="@+id/editText2"
        android:layout_width="130dp"
        android:layout_height="wrap_content"
        android:layout_marginStart="211dp"
        android:layout_marginTop="209dp"
        android:layout_marginEnd="100dp"
        android:layout_marginBottom="587dp"
        android:ems="10"
        android:inputType="text"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.452"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.071"
        android:layout_marginLeft="211dp"
```

```
        android:layout_marginRight="100dp" />

    <Button
        android:id="@+id/button"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="30dp"
        android:layout_marginTop="260dp"
        android:layout_marginEnd="175dp"
        android:layout_marginBottom="393dp"
        android:text="Insert"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.452"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.071"
        android:layout_marginLeft="30dp"
        android:layout_marginRight="175dp" />

    <Button
        android:id="@+id/buttonhome"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="260dp"
        android:layout_marginTop="260dp"
        android:layout_marginEnd="175dp"
        android:layout_marginBottom="393dp"
        android:text="Go to Home Page"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.452"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.071"
        android:layout_marginLeft="260dp"
        android:layout_marginRight="175dp" />

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

Following is the content of the res/layout/activity_triggeractivity.xml.

activity_triggeractivity.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=".triggeractivity">

    <TextView
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text="Triggering an alarm"
        android:textColor="@color/colorAccent"
        android:textSize="18sp"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.498"
        app:layout_constraintLeft_toLeftOf="parent"
        app:layout_constraintRight_toRightOf="parent"
```

```
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.071" />

    <TextView
        android:id="@+id/textView"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="35dp"
        android:layout_marginTop="112dp"
        android:layout_marginEnd="238dp"
        android:layout_marginBottom="600dp"
        android:text="Date : "
        android:textSize="18sp"
        android:textStyle="bold"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.452"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.071"
        android:layout_marginLeft="35dp"
        android:layout_marginRight="238dp" />

    <EditText
        android:id="@+id/editText"
        android:layout_width="130dp"
        android:layout_height="wrap_content"
        android:layout_marginStart="211dp"
        android:layout_marginTop="99dp"
        android:layout_marginEnd="100dp"
        android:layout_marginBottom="587dp"
        android:ems="10"
        android:inputType="text"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.452"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.071"
        android:layout_marginLeft="211dp"
        android:layout_marginRight="100dp" />


    <TextView
        android:id="@+id/textView1"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="71dp"
        android:layout_marginTop="159dp"
        android:layout_marginEnd="238dp"
        android:layout_marginBottom="600dp"
        android:text="Time of Day:"
        android:textSize="18sp"
        android:textStyle="bold"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.452"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.071"
        android:layout_marginLeft="71dp"
        android:layout_marginRight="238dp" />

    <EditText
        android:id="@+id/editText1"
        android:layout_width="130dp"
```

```
        android:layout_height="wrap_content"
        android:layout_marginStart="211dp"
        android:layout_marginTop="149dp"
        android:layout_marginEnd="100dp"
        android:layout_marginBottom="587dp"
        android:ems="10"
        android:inputType="text"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.452"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.071"
        android:layout_marginLeft="211dp"
        android:layout_marginRight="100dp" />


    <Button
        android:id="@+id/button"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="150dp"
        android:layout_marginTop="200dp"
        android:layout_marginEnd="175dp"
        android:layout_marginBottom="393dp"
        android:text="Trigger an Alarm"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.452"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.071"
        android:layout_marginLeft="150dp"
        android:layout_marginRight="175dp" />

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

Navigate to Android view. Right click on app → New → Android Resource Directory. Select the Resource type as raw and click → OK. Save an examples.mp3 file in the raw directory.

Following is the content of the src/AlarmF.java to trigger an alarm.

AlarmF.java

```
package com.example.example1b;

import android.content.BroadcastReceiver;
import android.content.Context;
import android.content.Intent;
import android.media.MediaPlayer;
import android.widget.Toast;

public class AlarmF extends BroadcastReceiver {
    MediaPlayer mp;

    @Override
    public void onReceive(Context context, Intent intent) {

        mp=MediaPlayer.create(context, R.raw.examples);
        mp.start();
        Toast.makeText(context, "Alarm....", Toast.LENGTH_LONG).show();
    }
}
```

Following is the content of the src/insertdata.java to insert the data into the database.

insertdata.java

```
package com.example.example1b;

import androidx.appcompat.app.AppCompatActivity;

import android.content.ContentValues;
import android.content.Intent;
import android.database.Cursor;
import android.database.sqlite.SQLiteDatabase;
import android.os.Bundle;
import android.view.View;
import android.widget.Button;
import android.widget.EditText;
import android.widget.Toast;

public class insertdata extends AppCompatActivity {


    Button btninsert,btnhomepage;
    EditText medname, meddate, medtime;

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


        medname = findViewById(R.id.editText);
        meddate = findViewById(R.id.editText1);
        medtime = findViewById(R.id.editText2);

        btninsert = findViewById(R.id.button);
        btnhomepage = findViewById(R.id.buttonhome);

        btninsert.setOnClickListener(new View.OnClickListener() {

            @Override
            public void onClick(View view) {

                String medicinename = medname.getText().toString();
                String medicinedate = meddate.getText().toString();
                String medicinetime = medtime.getText().toString();

                MedicineHelper helper = new MedicineHelper(getBaseContext(),
MedicineHelper.DATABASE_NAME, null, 1);
                SQLiteDatabase database = helper.getWritableDatabase();
                ContentValues cv = new ContentValues();
                cv.put("name",medicinename);
                cv.put("date",medicinedate);
                cv.put("time",medicinetime);

                database.insert("Medicine",null,cv);
                Toast.makeText(getBaseContext(),"Record inserted
successfully",Toast.LENGTH_LONG).show();

            }
        });

        btnhomepage.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                Intent home = new Intent(insertdata.this,MainActivity.class);
                startActivity(home);
```

```
            }
        });
    }
}
```

Following is the content of the src/Mainactivity.java

Mainactivity.java

```
package com.example.example1b;

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 {

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

        btninsert = findViewById(R.id.btn_insert);
        btntrigger = findViewById(R.id.btn_trigger);

        btninsert.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                Intent it = new Intent(MainActivity.this,insertdata.class);

                startActivity(it);
            }
        });
        btntrigger.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                Intent trigger = new Intent(MainActivity.this,triggeractivity.class);
                startActivity(trigger);
            }
        });
    }
}
```

Following is the content of the src/MedicineHelper.java that extends the SQLiteOpenHelper class.

MedicineHelper.java

```
package com.example.example1b;

import android.content.Context;
import android.database.sqlite.SQLiteDatabase;
import android.database.sqlite.SQLiteOpenHelper;

public class MedicineHelper extends SQLiteOpenHelper
{
```

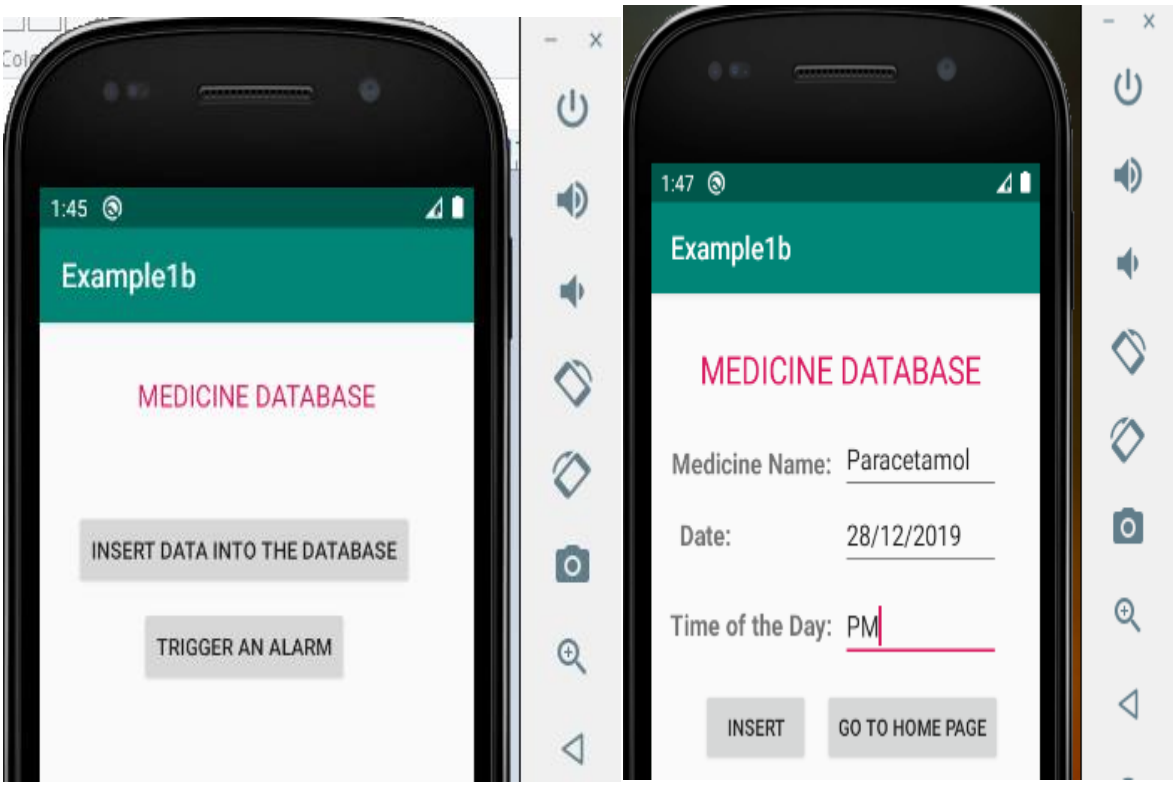
```
    public static String DATABASE_NAME="MEDICINE.db";
    public static String MEDICINE_TABLE="Medicine";
    public static String MEDICINE_COLUMN1 = "name";
    public static String MEDICINE_COLUMN2 = "date";
    public static String MEDICINE_COLUMN3 = "time";


    public MedicineHelper(Context context, String name, SQLiteDatabase.CursorFactory
factory, int version) {
        super(context, name, factory, version);
    }

    @Override
    public void onCreate(SQLiteDatabase sqLiteDatabase) {
        sqLiteDatabase.execSQL("create table Medicine (name TEXT, date TEXT, time
TEXT)");
    }

    @Override
    public void onUpgrade(SQLiteDatabase sqLiteDatabase, int i, int i1) {

    }
}
```

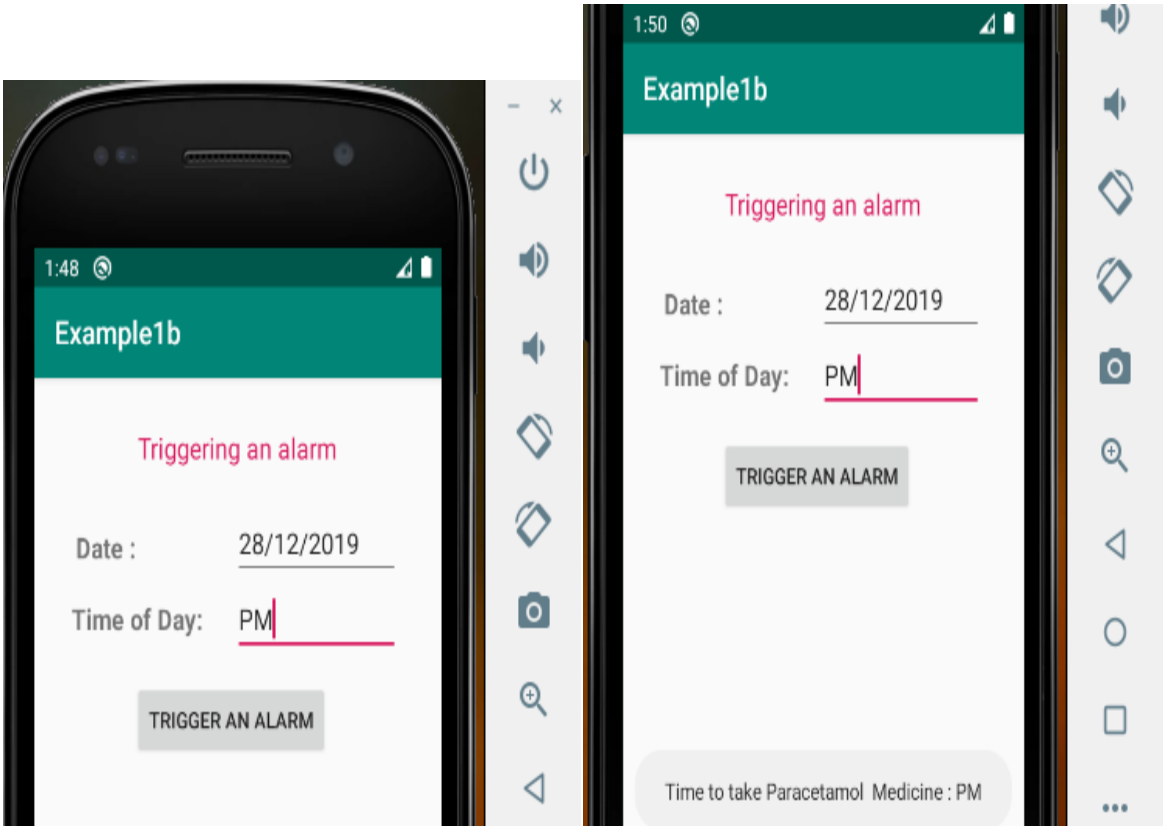
triggeractivity.java

```
package com.example.example1b;

import androidx.appcompat.app.AppCompatActivity;

import android.app.AlarmManager;
import android.app.PendingIntent;
import android.content.Context;
import android.content.Intent;
import android.database.Cursor;
import android.database.sqlite.SQLiteDatabase;
import android.os.Bundle;
import android.provider.AlarmClock;
import android.view.View;
import android.widget.Button;
import android.widget.EditText;
import android.widget.Toast;

public class triggeractivity extends AppCompatActivity {

    EditText txtdate,txtday;
    Button btntrigger;

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

        txtdate = findViewById(R.id.editText);
        txtday = findViewById(R.id.editText1);

        btntrigger = findViewById(R.id.button);
        btntrigger.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {

                String datetrg = txtdate.getText().toString().trim();
                String timeofday = txtday.getText().toString().trim();

                MedicineHelper helper = new MedicineHelper(getBaseContext(),
MedicineHelper.DATABASE_NAME, null, 1);
```

```
                SQLiteDatabase database = helper.getWritableDatabase();

                Cursor res = database.rawQuery("select * from Medicine where
Medicine.date = ? and Medicine.time = ? COLLATE NOCASE", new
String[]{datetrg,timeofday});

                if(res.getCount() == 0)
                {
                    Toast.makeText(getBaseContext(), "No DATA
",Toast.LENGTH_LONG).show();
                }
                while (res.moveToNext())
                {
                    Intent intent = new Intent(triggeractivity.this, AlarmF.class);
                    PendingIntent pendingIntent =
PendingIntent.getBroadcast(getBaseContext(), 234324243, intent, 0);
                    AlarmManager alarmManager = (AlarmManager)
getSystemService(ALARM_SERVICE);
                    alarmManager.set(AlarmManager.RTC_WAKEUP,
System.currentTimeMillis() + (1 * 1000), pendingIntent);
                    Toast.makeText(getBaseContext(), "Alarm set in 1
seconds",Toast.LENGTH_LONG).show();
                    Toast.makeText(getBaseContext(), "Time to take "+
res.getString(0)+ "  Medicine : "+res.getString(2),Toast.LENGTH_LONG).show();
                }
            }
        });
    }
}
```

Output:





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 DatePicker 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".

Content Provider part

First, create the android application as discussed in "Create your First Android Application". Following is the content of the modified res/layout/activity_main.xml.

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:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text="MEETING SCHEDULE"
        android:textColor="@color/colorAccent"
        android:textSize="18sp"
```

```
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.498"
        app:layout_constraintLeft_toLeftOf="parent"
        app:layout_constraintRight_toRightOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.077" />

    <TextView
        android:id="@+id/textView"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="6dp"
        android:layout_marginTop="112dp"
        android:layout_marginEnd="238dp"
        android:layout_marginBottom="600dp"
        android:text="Date:"
        android:textSize="18sp"
        android:textStyle="bold"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.452"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.071" />

    <EditText
        android:id="@+id/editText"
        android:layout_width="130dp"
        android:layout_height="wrap_content"
        android:layout_marginStart="211dp"
        android:layout_marginTop="99dp"
        android:layout_marginEnd="100dp"
        android:layout_marginBottom="587dp"
        android:ems="10"
        android:inputType="text"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.452"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.071" />


    <TextView
        android:id="@+id/textView1"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="6dp"
        android:layout_marginTop="159dp"
        android:layout_marginEnd="238dp"
        android:layout_marginBottom="600dp"
        android:text="Time:"
        android:textSize="18sp"
        android:textStyle="bold"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.452"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.071" />

    <EditText
        android:id="@+id/editText1"
        android:layout_width="130dp"
        android:layout_height="wrap_content"
```

```
        android:layout_marginStart="211dp"
        android:layout_marginTop="149dp"
        android:layout_marginEnd="100dp"
        android:layout_marginBottom="587dp"
        android:ems="10"
        android:inputType="text"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.452"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.071" />

    <TextView
        android:id="@+id/textView2"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="71dp"
        android:layout_marginTop="219dp"
        android:layout_marginEnd="238dp"
        android:layout_marginBottom="600dp"
        android:text="Meeting Agenda:"
        android:textSize="18sp"
        android:textStyle="bold"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.452"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.071" />

    <EditText
        android:id="@+id/editText2"
        android:layout_width="130dp"
        android:layout_height="wrap_content"
        android:layout_marginStart="211dp"
        android:layout_marginTop="209dp"
        android:layout_marginEnd="100dp"
        android:layout_marginBottom="587dp"
        android:ems="10"
        android:inputType="text"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.452"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.071" />

    <Button
        android:id="@+id/button"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="148dp"
        android:layout_marginTop="260dp"
        android:layout_marginEnd="175dp"
        android:layout_marginBottom="393dp"
        android:text="Add Meeting Agenda"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.452"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.071"/>



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

Following is the content of the modified src/MainActivity.java

MainActivity.java

```
package com.example.vtucontentprovider;

import androidx.appcompat.app.AppCompatActivity;

import android.content.ContentValues;
import android.database.Cursor;
import android.net.Uri;
import android.os.Bundle;
import android.view.View;
import android.widget.Button;
import android.widget.EditText;
import android.widget.Toast;

public class MainActivity extends AppCompatActivity {

    Button addagenda;
    EditText date, time, meetingagenda;


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


        addagenda = findViewById(R.id.button);

        date = findViewById(R.id.editText);
        time = findViewById(R.id.editText1);
        meetingagenda = findViewById(R.id.editText2);

        addagenda.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {
                String addage = meetingagenda.getText().toString();
                String adddate = date.getText().toString();
                String addtime = time.getText().toString();

                Toast.makeText(getBaseContext(),addage,Toast.LENGTH_SHORT).show();

                ContentValues values = new ContentValues();
                values.put("agenda_date",adddate);
                values.put("agenda_time",addtime);
                values.put("agenda_content",addage);

                Uri id =
getContentResolver().insert(Uri.parse("content://com.example.vtucontentprovider.Agenda
Provider/agenda"),values);
                Toast.makeText(getBaseContext(),id.toString(),
Toast.LENGTH_LONG).show();

                Toast.makeText(getBaseContext(),"Data Inserted Successfully",
Toast.LENGTH_LONG).show();

            }
        });
    }
}
```

Create a new java class file. Following is the content of the modified src/AgendaProvider.java that extends ContentProvider class.

AgendaProvider.java

```
package com.example.vtucontentprovider;

import android.content.ContentProvider;
import android.content.ContentUris;
import android.content.ContentValues;
import android.content.UriMatcher;
import android.database.Cursor;
import android.database.sqlite.SQLiteDatabase;
import android.net.Uri;
import android.widget.Toast;

public class AgendaProvider extends ContentProvider {

    SQLiteDatabase db;
    MeetingDb dbHelper;

    static final String AUTHORITY = "com.example.vtucontentprovider.AgendaProvider";
    static final Uri CONTENT_URI = Uri.parse("content://" + AUTHORITY + "/agenda");

    static final UriMatcher uriMatcher;
    static{
        uriMatcher = new UriMatcher(UriMatcher.NO_MATCH);
        uriMatcher.addURI("com.example.vtucontentprovider.AgendaProvider",
"agenda",1);
    }

    @Override
    public boolean onCreate() {
        dbHelper = new MeetingDb(getContext(),MeetingDb.DATABASE_NAME+".db",null,1);
        if(db != null) {
            return true;
        }
        return false;
    }

    @Override
    public Cursor query(Uri uri, String[] strings, String s, String[] strings1, String
s1) {

        String sqlstr = "select * from agenda where agenda_date = ?";
        db = dbHelper.getWritableDatabase();
        Cursor cursor = null;
        cursor = db.rawQuery(sqlstr, strings1);
        return cursor;

     }

    @Override
    public String getType(Uri uri) {
    return null;
    }

    @Override
    public Uri insert(Uri uri, ContentValues contentValues) {

        db = dbHelper.getWritableDatabase();
        long id = db.insert(MeetingDb.TABLE_NAME,null, contentValues);

        if(id>0)
        {
```

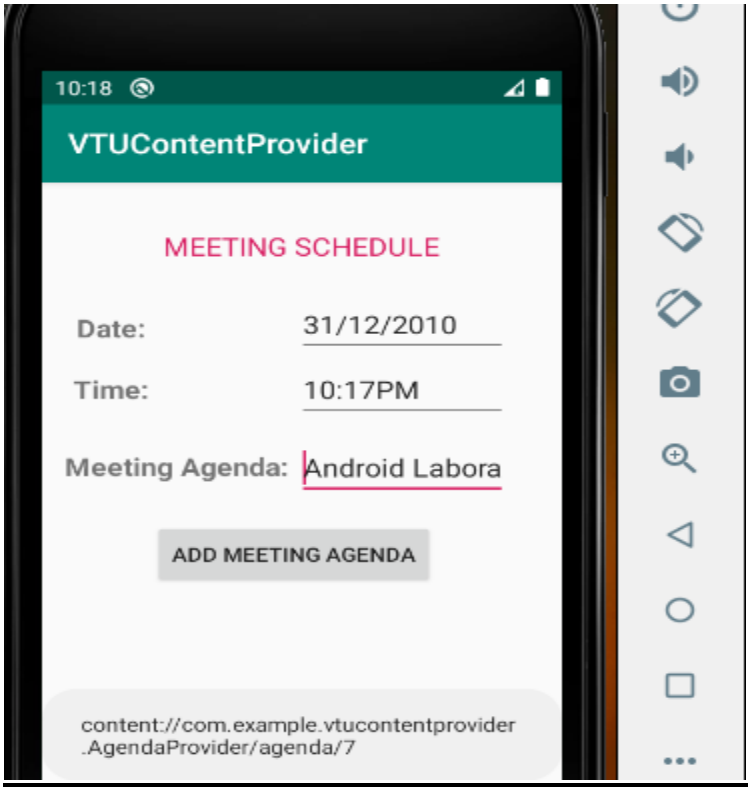
```
            Uri _uri = ContentUris.withAppendedId(CONTENT_URI, id);
            getContext().getContentResolver().notifyChange(_uri,null);
            db.close();
            return  _uri;
        }
        else
        {
            Toast.makeText(getContext(),"ROW INSERT
FAILED",Toast.LENGTH_SHORT).show();
            db.close();
            return  null;
        }
    }
    @Override
    public int delete(Uri uri, String s, String[] strings) {
        return 0;
    }

    @Override
    public int update(Uri uri, ContentValues contentValues, String s, String[]
strings) {
        return 0;
    }
}
```

Following is the content of the src/MeetingDb.java that extends SQLiteOpenHelper class.

MeetingDb.java

```
package com.example.vtucontentprovider;

import android.content.Context;
import android.database.sqlite.SQLiteDatabase;
import android.database.sqlite.SQLiteOpenHelper;

public class MeetingDb  extends SQLiteOpenHelper {

    public static String DATABASE_NAME="provideragenda";
    public static String TABLE_NAME="agenda";


    public MeetingDb(Context context, String name, SQLiteDatabase.CursorFactory
factory, int version) {
        super(context, name, factory, version);
    }

    @Override
    public void onCreate(SQLiteDatabase sqLiteDatabase) {
        sqLiteDatabase.execSQL("create table agenda (agenda_date TEXT, agenda_time
TEXT, agenda_content TEXT)");
    }

    @Override
    public void onUpgrade(SQLiteDatabase sqLiteDatabase, int i, int i1) {

    }
}
```

Output:



Content Resolver part

Create another android application as discussed in "Create your First Android Application". Following is the content of the modified res/layout/activity_main.xml.

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:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text="MEETING INFO"
        android:textColor="@color/colorAccent"
        android:textSize="24sp"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintHorizontal_bias="0.457"
        app:layout_constraintLeft_toLeftOf="parent"
        app:layout_constraintRight_toRightOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.071" />

    <TextView
        android:id="@+id/textView"
```

```
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="10dp"
        android:layout_marginTop="76dp"
        android:layout_marginEnd="297dp"
        android:layout_marginBottom="596dp"
        android:text="Pick a date to get meeting info:"
        android:textStyle="bold"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.0"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />


    <EditText
        android:id="@+id/calendarView"
        android:layout_width="110dp"
        android:layout_height="wrap_content"
        android:layout_marginStart="31dp"
        android:layout_marginTop="120dp"
        android:layout_marginEnd="15dp"
        android:layout_marginBottom="275dp"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent" />

    <Button
        android:id="@+id/button"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="31dp"
        android:layout_marginTop="350dp"
        android:layout_marginEnd="171dp"
        android:layout_marginBottom="330dp"
        android:text="Search"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="1.0"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent" />

    <TextView
        android:id="@+id/txt_disp"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="31dp"
        android:layout_marginTop="280dp"
        android:layout_marginEnd="90dp"
        android:layout_marginBottom="80dp"
        android:text="display result"
        android:textStyle="bold"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="1.0"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0" />


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

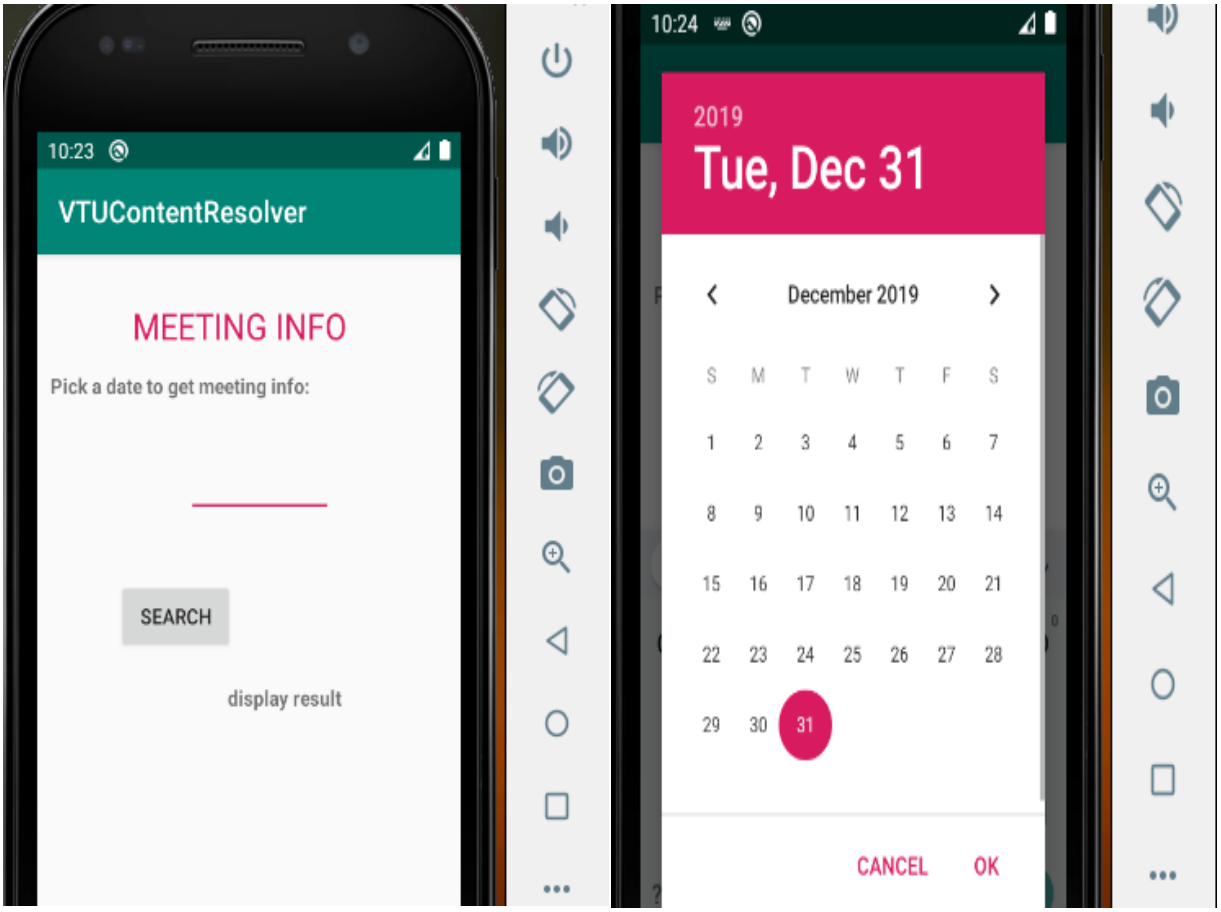
Following is the content of the modified src/MainActivity.java

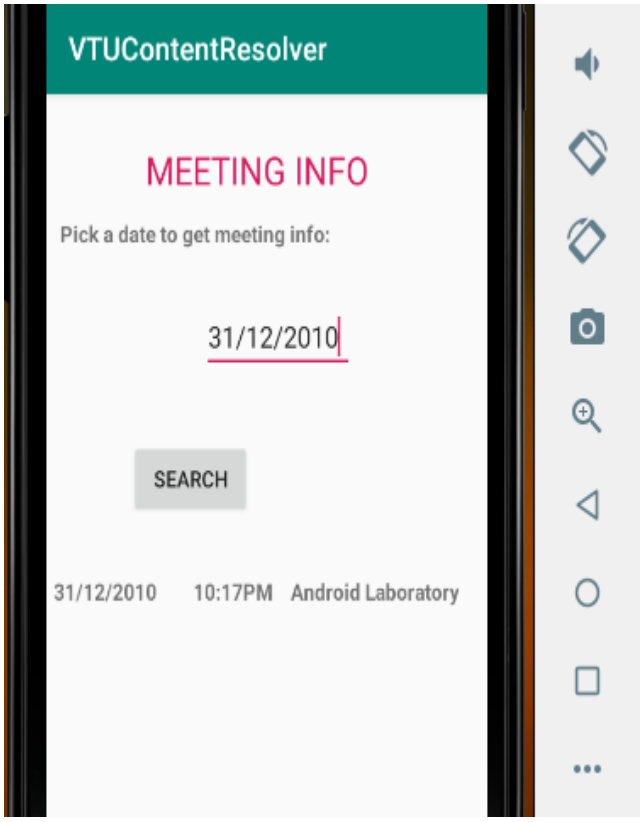
MainActivity.java

```
package com.example.vtucontentresolver;

import androidx.appcompat.app.AppCompatActivity;

import android.app.DatePickerDialog;
import android.database.Cursor;
import android.net.Uri;
import android.os.Bundle;
import android.view.View;
import android.widget.Button;
import android.widget.DatePicker;
import android.widget.EditText;
import android.widget.TextView;
import android.widget.Toast;

import java.util.Calendar;

public class MainActivity extends AppCompatActivity {

    Button search;
    EditText txtdatepicker;
    TextView txtdisplay;
    DatePickerDialog picker;
    String URL = "content://com.example.vtucontentprovider.AgendaProvider/agenda";
    Uri var = Uri.parse(URL);

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

        txtdisplay = findViewById(R.id.txt_disp);
        txtdatepicker = findViewById(R.id.calendarView);

        txtdatepicker.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {

                final Calendar cldr = Calendar.getInstance();
                int day = cldr.get(Calendar.DAY_OF_MONTH);
                int month = cldr.get(Calendar.MONTH);
                int year = cldr.get(Calendar.YEAR);

                picker = new DatePickerDialog(MainActivity.this, new
DatePickerDialog.OnDateSetListener() {
                    @Override
                    public void onDateSet(DatePicker datePicker, int year, int month,
int date) {
                        txtdatepicker.setText(date+"/"+(month+1)+"/"+year);
                    }
                },year,month,day);
                picker.show();
            }
        });

        search = findViewById(R.id.button);
        search.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {

                String[] mProjection = {"agenda_date" , "agenda_time",
"agenda_content"};
```

```
                String searchdate = txtdatepicker.getText().toString().trim();

                String where="agenda_date=?";

                Cursor cursor =
getContentResolver().query(Uri.parse("content://com.example.vtucontentprovider.AgendaP
rovider/agenda"), mProjection, where, new String[]{searchdate},null);

                txtdisplay.setText(" ");
                String res  = " ";

                if(cursor.getCount() == 0)
                {
                    Toast.makeText(getBaseContext(),"No Data Available",
Toast.LENGTH_LONG).show();
                }

               while(cursor != null && cursor.moveToNext())
                {
                        String adate =
cursor.getString(cursor.getColumnIndex("agenda_date"));
                        String atime =
cursor.getString(cursor.getColumnIndex("agenda_time"));
                        String acontent =
cursor.getString(cursor.getColumnIndex("agenda_content"));

                        res = res + "\n" + adate +"     "+ "    " + atime + "     " +
acontent ;
                        Toast.makeText(getBaseContext(), res,
Toast.LENGTH_LONG).show();
                }
                txtdisplay.setText(res);
            }
        });
    }
}
```

Output:


10:23
VTUContentResolver
MEETING INFO
Pick a date to get meeting info:
SEARCH
display result
10:24
2019
Tue, Dec 31
December 2019
S M T W T F S
1 2 3 4 5 6 7
8 9 10 11 12 13 14
15 16 17 18 19 20 21
22 23 24 25 26 27 28
29 30 31
CANCEL
OK


VTUContentResolver
MEETING INFO
Pick a date to get meeting info:
31/12/2010
SEARCH
31/12/2010 10:17PM Android Laboratory

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.

First, create the android application as discussed in "Create your First Android Application". Following is the content of the modified res/layout/activity_main.xml.

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:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text="SMS APPLICATION"
        android:textColor="@color/colorAccent"
        android:textSize="18sp"
        android:textStyle="bold"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintLeft_toLeftOf="parent"
        app:layout_constraintRight_toRightOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.041" />

    <TextView
        android:id="@+id/txtnumber"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="90dp"
        android:layout_marginTop="75dp"
        android:layout_marginEnd="70dp"
        android:layout_marginBottom="587dp"
        android:text="Display SMS Number"
        android:textStyle="bold"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.0"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0"
        android:layout_marginLeft="90dp"
        android:layout_marginRight="70dp" />


    <TextView
        android:id="@+id/txtmessage"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="90dp"
        android:layout_marginTop="115dp"
        android:layout_marginEnd="70dp"
        android:layout_marginBottom="587dp"
        android:text="Display SMS Message"
        android:textStyle="bold"
```

```
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.0"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.0"
        android:layout_marginLeft="90dp"
        android:layout_marginRight="70dp" />

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

Following is the content of the modified src/MainActivity.java

MainActivity.java

```
package com.example.smsreplied;

import androidx.appcompat.app.AppCompatActivity;
import androidx.core.app.ActivityCompat;
import androidx.core.content.ContextCompat;

import android.Manifest;
import android.content.Intent;
import android.content.pm.PackageManager;
import android.os.Bundle;
import android.widget.TextView;
import android.widget.Toast;

public class MainActivity extends AppCompatActivity {

    private static final int MY_PERMISSION_REQUEST_RECEIVE_SMS = 0;
    TextView txtnumber, txtmessage;

    @Override
    protected void onCreate(Bundle savedInstanceState) {

        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);

        if(ContextCompat.checkSelfPermission(MainActivity.this,
Manifest.permission.RECEIVE_SMS) != PackageManager.PERMISSION_GRANTED)
        {

if(ActivityCompat.shouldShowRequestPermissionRationale(MainActivity.this,Manifest.perm
ission.RECEIVE_SMS))
            {
                //Do not do anything
            }
            else
            {
                ActivityCompat.requestPermissions(MainActivity.this,new
String[]{Manifest.permission.RECEIVE_SMS},MY_PERMISSION_REQUEST_RECEIVE_SMS);
            }
        }

        Bundle b = getIntent().getBundleExtra("data");
        txtnumber = findViewById(R.id.txtnumber);
        txtmessage = findViewById(R.id.txtmessage);

        if(b!=null){

            String number=b.getString("number");
            String content=b.getString("content");
```

```
            txtnumber.setText(number);
            txtmessage.setText(content);
            }
    }

    @Override
    public void onRequestPermissionsResult(int requestCode, String permissions[],
int[] grantResults )
    {
        switch (requestCode)
        {
            case MY_PERMISSION_REQUEST_RECEIVE_SMS:
            {
                if(grantResults.length >0 && grantResults[0] ==
PackageManager.PERMISSION_GRANTED)
                {
                    Toast.makeText(this,"Thank you for
permitting",Toast.LENGTH_LONG).show();
                }
                else
                {
                    Toast.makeText(this,"Cant do anything until you permit
me",Toast.LENGTH_LONG).show();
                }
            }
        }
    }
}
```

Following is the content of the src/MySMSReceiver.java

MySMSReceiver.java

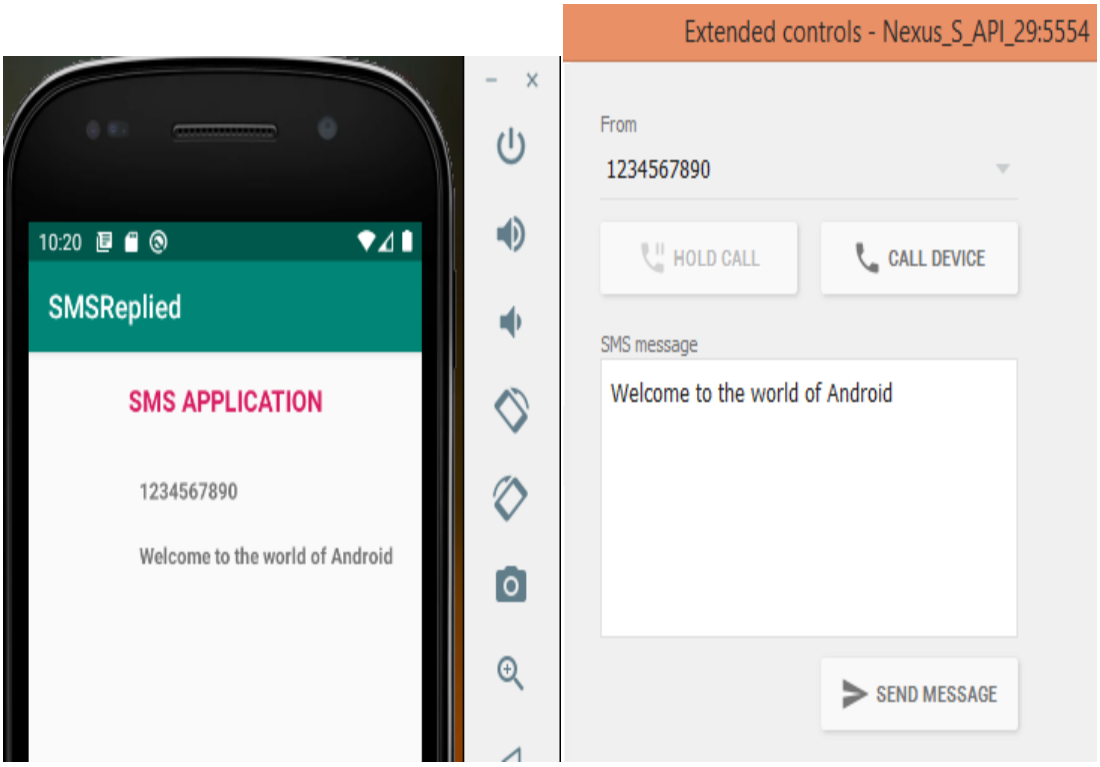
```
package com.example.smsreplied;

import android.content.BroadcastReceiver;
import android.content.Context;
import android.content.Intent;
import android.os.Build;
import android.os.Bundle;
import android.telephony.SmsMessage;
import android.provider.Telephony.Sms;
import android.widget.Toast;

public class MySMSReceiver extends BroadcastReceiver {

    private static final String SMS_RECEIVED =
"android.provider.Telephony.SMS_RECEIVED";
    private static final String TAG = "SmsBroadcastReceiver";


    @Override
    public void onReceive(Context context, Intent intent) {

        if(intent.getAction() == SMS_RECEIVED)
        {
            Bundle bundle = intent.getExtras();

       SmsMessage[] smsm = null;
            String sms_str ="";
            if(bundle != null)
            {
                Object[] pdus = (Object[]) bundle.get("pdus");
                smsm = new SmsMessage[pdus.length];
```

```
                String senderNumber = null;
                String senderMessage = null;
                for(int i = 0; i < pdus.length; i++) {
                    if (Build.VERSION.SDK_INT >= Build.VERSION_CODES.M) {
                        String format = bundle.getString("format");
                        smsm[i] = SmsMessage.createFromPdu((byte[]) pdus[i], format);
                    } else {
                        smsm[i] = SmsMessage.createFromPdu((byte[]) pdus[i]);
                    }

                    Bundle b1 = new Bundle();
                    b1.putString("number", smsm[i].getOriginatingAddress());
                    b1.putString("content", smsm[i].getMessageBody());

                    Intent smsIntent = new Intent(context, MainActivity.class);
                    smsIntent.setFlags(Intent.FLAG_ACTIVITY_NEW_TASK);
                    smsIntent.putExtra("data", b1);
                    context.startActivity(smsIntent);
                }
                Toast.makeText(context,sms_str ,Toast.LENGTH_LONG).show();
            }
        }
    }
}
```

AndroidManifest.xml

```
<uses-permission android:name="android.permission.RECEIVE_SMS"></uses-permission>
<uses-permission android:name="android.permission.READ_SMS" ></uses-permission>
<uses-permission android:name="android.permission.SEND_SMS"></uses-permission>

<intent-filter android:priority="999">
    <action android:name="android.provider.Telephony.SMS_RECEIVED" />
</intent-filter>
```

Output: Run the emulator and click on Extended Controls (….). Select the Phone tab. Enter the phone number and the message and click → Send



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".

First, create the android application as discussed in "Create your First Android Application". Following is the content of the modified res/layout/activity_main.xml.

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:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text="FILE APPLICATION"
        android:textColor="@color/colorAccent"
        android:textSize="24sp"
        android:textStyle="bold"
```

```
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintLeft_toLeftOf="parent"
        app:layout_constraintRight_toRightOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.058" />

    <Button
        android:id="@+id/buttoncreate"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="62dp"
        android:layout_marginTop="87dp"
        android:layout_marginEnd="241dp"
        android:layout_marginBottom="576dp"
        android:text="Create"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.041"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.058" />

    <Button
        android:id="@+id/buttonopen"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="169dp"
        android:layout_marginTop="87dp"
        android:layout_marginEnd="114dp"
        android:layout_marginBottom="576dp"
        android:text="Open"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.041"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.058" />

    <EditText
        android:id="@+id/editText"
        android:layout_width="wrap_content"
        android:layout_height="130dp"
        android:layout_marginStart="58dp"
        android:layout_marginTop="133dp"
        android:layout_marginEnd="135dp"
        android:layout_marginBottom="513dp"
        android:ems="10"
        android:gravity="start|top"
        android:inputType="textMultiLine"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.041"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.058" />

    <Button
        android:id="@+id/buttonsave"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="121dp"
        android:layout_marginTop="270dp"
        android:layout_marginEnd="202dp"
        android:layout_marginBottom="372dp"
        android:text="Save"
```

```
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.041"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.058" />

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

Following is the content of the modified src/MainActivity.java

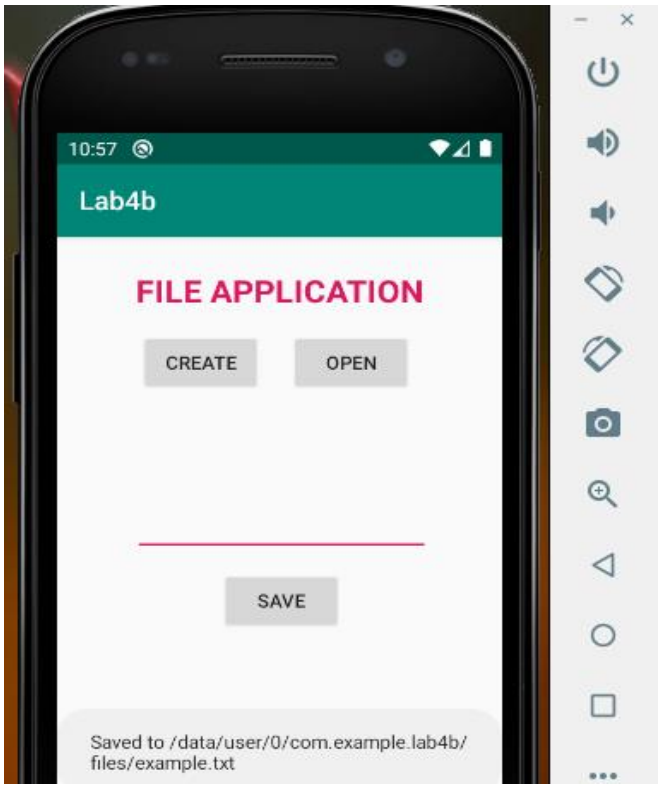
MainActivity.java

```
package com.example.lab4b;

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;

import java.io.BufferedReader;
import java.io.FileInputStream;
import java.io.FileNotFoundException;
import java.io.FileOutputStream;
import java.io.IOException;
import java.io.InputStreamReader;

public class MainActivity extends AppCompatActivity {

    Button btncreate, btnopen, btnsave;
    EditText txtinput;

    private static final String FILE_NAME = "example.txt";

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

        txtinput = findViewById(R.id.editText);
        btncreate = findViewById(R.id.buttoncreate);
        btnopen = findViewById(R.id.buttonopen);
        btnsave = findViewById(R.id.buttonsave);

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

                String text = txtinput.getText().toString();
                FileOutputStream fos = null;

                try {
                    fos = openFileOutput(FILE_NAME,MODE_PRIVATE);
                    fos.write(text.getBytes());

                    txtinput.getText().clear();

                    Toast.makeText(MainActivity.this,"Saved to "+getFilesDir() + "/" +
FILE_NAME,Toast.LENGTH_LONG).show();
                } catch (FileNotFoundException e) {
                    e.printStackTrace();
```

```
                } catch (IOException e) {
                    e.printStackTrace();
                }
                finally {
                    if(fos != null)
                    {
                        try {
                            fos.close();
                        } catch (IOException e) {
                            e.printStackTrace();
                        }
                    }
                }
            }
        });

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

                FileInputStream fis = null;
                try {
                    fis = openFileInput(FILE_NAME);
                    InputStreamReader isr = new InputStreamReader(fis);
                    BufferedReader br = new BufferedReader(isr);
                    StringBuilder sb = new StringBuilder();
                    String text;

                    while ((text = br.readLine()) != null)
                    {
                        sb.append(text).append("\n");

                    }
                    txtinput.setText(sb.toString());


                } catch (FileNotFoundException e) {
                    e.printStackTrace();
                } catch (IOException e) {
                    e.printStackTrace();
                }
                finally {
                    if (fis != null)
                    {
                        try {
                            fis.close();
                        } catch (IOException e) {
                            e.printStackTrace();
                        }
                    }
                }

            }
        });

        btnsave.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                String text = txtinput.getText().toString();
                if (text.isEmpty()) {
                    Toast.makeText(MainActivity.this, "First Create the File",
Toast.LENGTH_LONG).show();
                } else {

                    FileOutputStream fss = null;
                    try {
                        fss = openFileOutput(FILE_NAME, MODE_PRIVATE);
```

```
                        fss.write(text.getBytes());

                        txtinput.getText().clear();

                        Toast.makeText(MainActivity.this, "Saved to " + getFilesDir()
+ "/" + FILE_NAME, Toast.LENGTH_LONG).show();


                    } catch (FileNotFoundException e) {
                        e.printStackTrace();
                    } catch (IOException e) {
                        e.printStackTrace();
                    } finally {
                        if (fss != null) {
                            try {
                                fss.close();
                            } catch (IOException e) {
                                e.printStackTrace();
                            }
                        }
                    }

                }
            }

        });
    }
}
```

Output:



The example.txt file will be saved to /data/user/0/com.example.lab4b/files/example.txt. To check the existence of the file click on View → Tool Windows → Device File Explorer. In this window check the folder /data/user/0/com.example.lab4b/files.

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.

First, create the android application as discussed in "Create your First Android Application". Following is the content of the modified res/layout/activity_main.xml.

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:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text="MEDIA PLAYER APPLICATION"
        android:textColor="@color/colorAccent"
        android:textSize="18sp"
        android:textStyle="bold"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintHorizontal_bias="0.443"
        app:layout_constraintLeft_toLeftOf="parent"
        app:layout_constraintRight_toRightOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.047" />

    <SeekBar
        android:id="@+id/seekBar2"
        android:layout_width="240dp"
        android:layout_height="wrap_content"
        android:layout_marginStart="162dp"
        android:layout_marginTop="160dp"
        android:layout_marginEnd="208dp"
        android:layout_marginBottom="613dp"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintHorizontal_bias="0.443"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.047" />

    <Button
        android:id="@+id/buttonbackward"
        android:layout_width="55dp"
        android:layout_height="55dp"
        android:layout_marginStart="64dp"
        android:layout_marginTop="203dp"
        android:layout_marginEnd="249dp"
        android:layout_marginBottom="520dp"
        android:text="B"
        android:textSize="18sp"
        android:textStyle="bold"
```

```
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.443"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.047" />

    <Button
        android:id="@+id/buttonforward"
        android:layout_width="55dp"
        android:layout_height="55dp"
        android:layout_marginStart="90dp"
        android:layout_marginTop="203dp"
        android:layout_marginEnd="136dp"
        android:layout_marginBottom="520dp"
        android:text="F"
        android:textSize="18sp"
        android:textStyle="bold"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.443"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.047" />


    <Button
        android:id="@+id/buttonpause"
        android:layout_width="55dp"
        android:layout_height="55dp"
        android:layout_marginStart="290dp"
        android:layout_marginTop="203dp"
        android:layout_marginEnd="249dp"
        android:layout_marginBottom="520dp"
        android:text="P"
        android:textSize="18sp"
        android:textStyle="bold"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.443"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.047" />

    <Button
        android:id="@+id/buttonplay"
        android:layout_width="55dp"
        android:layout_height="55dp"
        android:layout_marginStart="310dp"
        android:layout_marginTop="203dp"
        android:layout_marginEnd="136dp"
        android:layout_marginBottom="520dp"
        android:text="PL"
        android:textSize="18sp"
        android:textStyle="bold"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.443"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.047" />

    <TextView
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:textAppearance="?android:attr/textAppearanceSmall"
        android:text="Small Text"
```

```
        android:id="@+id/textView2"
        android:layout_marginStart="5dp"
        android:layout_marginTop="140dp"
        android:layout_marginEnd="208dp"
        android:layout_marginBottom="613dp"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintHorizontal_bias="0.443"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.047" />

    <TextView
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:textAppearance="?android:attr/textAppearanceSmall"
        android:text="Small Text"
        android:id="@+id/textView3"
        android:layout_marginStart="400dp"
        android:layout_marginTop="140dp"
        android:layout_marginEnd="208dp"
        android:layout_marginBottom="613dp"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintHorizontal_bias="0.443"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.047" />

    <TextView
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:textAppearance="?android:attr/textAppearanceMedium"
        android:text="Medium Text"
        android:id="@+id/textView4"
        android:layout_marginStart="192dp"
        android:layout_marginTop="140dp"
        android:layout_marginEnd="208dp"
        android:layout_marginBottom="613dp"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintHorizontal_bias="0.443"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.047" />

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

Navigate to Android view. Right click on app → New → Android Resource Directory. Select the Resource type as raw and click → OK. Save Song.mp3 file in the raw directory.

Following is the content of the modified src/MainActivity.java

MainActivity.java

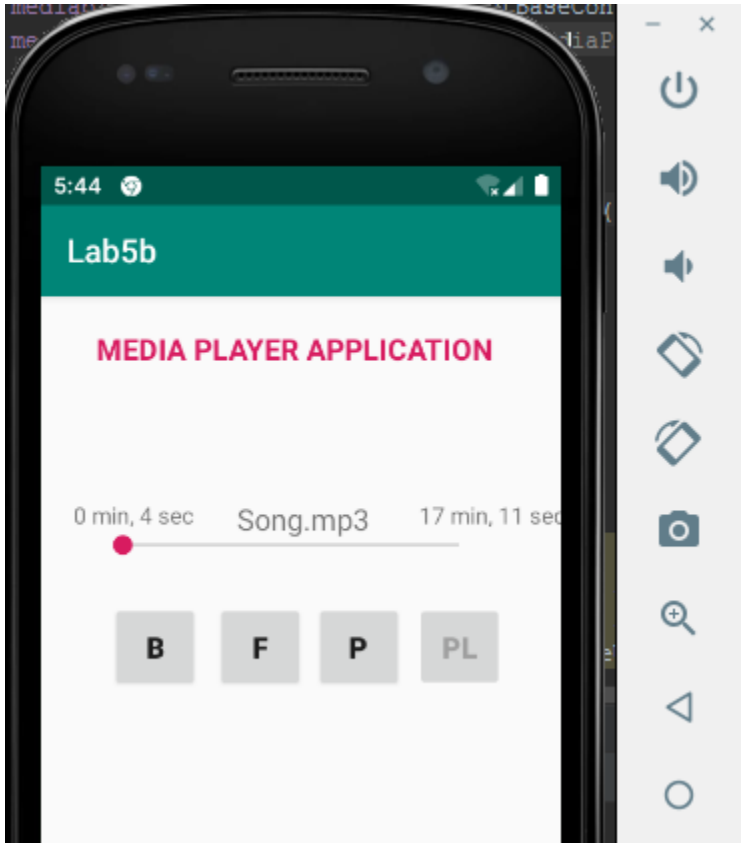
```
package com.example.lab5b;

import androidx.appcompat.app.AppCompatActivity;

import android.media.MediaPlayer;
import android.os.Bundle;
import android.os.Handler;
import android.view.View;
```

```
import android.widget.Button;
import android.widget.SeekBar;
import android.widget.TextView;
import android.widget.Toast;

import java.util.concurrent.TimeUnit;

public class MainActivity extends AppCompatActivity {

    private Button btnback,btnfor,btnpause,btnplay;
    private MediaPlayer mediaplayer;
    private TextView txt1,txt2,txt3;


    private double startTime = 0;
    private double finalTime = 0;

    private Handler myHandler = new Handler();
    private int forwardTime = 5000;
    private int backwardTime = 5000;
    private SeekBar seekbar;

    public static int oneTimeOnly = 0;

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


        btnback = findViewById(R.id.buttonbackward);
        btnfor = findViewById(R.id.buttonforward);
        btnpause = findViewById(R.id.buttonpause);
        btnplay = findViewById(R.id.buttonplay);

        txt1 = (TextView)findViewById(R.id.textView2);
        txt2 = (TextView)findViewById(R.id.textView3);
        txt3 = (TextView)findViewById(R.id.textView4);
        txt3.setText("Song.mp3");

        seekbar = (SeekBar)findViewById(R.id.seekBar2);
        seekbar.setClickable(false);
        btnpause.setEnabled(false);

        btnplay.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {

                Toast.makeText(getApplicationContext(), "Playing
sound",Toast.LENGTH_SHORT).show();
                if(mediaplayer == null)
                {
                    mediaplayer = MediaPlayer.create(getBaseContext(), R.raw.song);
                    mediaplayer.setOnCompletionListener(new
MediaPlayer.OnCompletionListener() {
                        @Override
                        public void onCompletion(MediaPlayer mediaPlayer) {
                            mediaPlayer.stop();
                        }
                    });

                    finalTime = mediaplayer.getDuration();
                    startTime = mediaplayer.getCurrentPosition();

                    if (oneTimeOnly == 0) {
                        seekbar.setMax((int) finalTime);
                        oneTimeOnly = 1;
```

```
                    }
                }
                mediaplayer.start();


                txt2.setText(String.format("%d min, %d sec",
                        TimeUnit.MILLISECONDS.toMinutes((long) finalTime),
                        TimeUnit.MILLISECONDS.toSeconds((long) finalTime) -

TimeUnit.MINUTES.toSeconds(TimeUnit.MILLISECONDS.toMinutes((long)
                                        finalTime)))
                );

                txt1.setText(String.format("%d min, %d sec",
                        TimeUnit.MILLISECONDS.toMinutes((long) startTime),
                        TimeUnit.MILLISECONDS.toSeconds((long) startTime) -

TimeUnit.MINUTES.toSeconds(TimeUnit.MILLISECONDS.toMinutes((long)
                                        startTime)))
                );

                seekbar.setProgress((int)startTime);
                myHandler.postDelayed(UpdateSongTime,100);
                btnpause.setEnabled(true);
                btnplay.setEnabled(false);
            }
        });

        btnpause.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {

                Toast.makeText(getApplicationContext(), "Pausing
sound",Toast.LENGTH_SHORT).show();
                        mediaplayer.pause();
                btnpause.setEnabled(false);
                btnplay.setEnabled(true);

            }
        });

        btnfor.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {
                int temp = (int)startTime;

                if((temp+forwardTime)<=finalTime){
                    startTime = startTime + forwardTime;
                    mediaplayer.seekTo((int) startTime);
                    Toast.makeText(getApplicationContext(),"You have Jumped forward 5
seconds",Toast.LENGTH_SHORT).show();
                }
                else
                    {
                    Toast.makeText(getApplicationContext(),"Cannot jump forward 5
seconds",Toast.LENGTH_SHORT).show();
                }
            }
        });

        btnback.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {
                int temp = (int)startTime;

                if((temp-backwardTime)>0){
                    startTime = startTime - backwardTime;
```

```
                    mediaplayer.seekTo((int) startTime);
                    Toast.makeText(getApplicationContext(),"You have Jumped backward 5
seconds",Toast.LENGTH_SHORT).show();
                }else{
                    Toast.makeText(getApplicationContext(),"Cannot jump backward 5
seconds",Toast.LENGTH_SHORT).show();
                }
            }
        });

    }

    private Runnable UpdateSongTime = new Runnable() {
        public void run() {
            startTime = mediaplayer.getCurrentPosition();
            txt1.setText(String.format("%d min, %d sec",
                    TimeUnit.MILLISECONDS.toMinutes((long) startTime),
                    TimeUnit.MILLISECONDS.toSeconds((long) startTime) -
                            TimeUnit.MINUTES.toSeconds(TimeUnit.MILLISECONDS.
                                    toMinutes((long) startTime)))
            );
            seekbar.setProgress((int)startTime);
            myHandler.postDelayed(this, 100);
        }
    };
}
```

Output:



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".

First, create the android application as discussed in "Create your First Android Application". Following is the content of the modified res/layout/activity_main.xml.

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:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text="ASYNCHRONOUS TASK"
        android:textColor="@color/colorAccent"
        android:textSize="24sp"
        android:textStyle="bold"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintLeft_toLeftOf="parent"
        app:layout_constraintRight_toRightOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.053" />

    <Button
        android:id="@+id/buttonstart"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="102dp"
        android:layout_marginTop="92dp"
        android:layout_marginEnd="152dp"
        android:layout_marginBottom="572dp"
        android:text="Start Task"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.0471"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.053"
        android:layout_marginLeft="102dp"
        android:layout_marginRight="152dp" />


    <Button
        android:id="@+id/buttonstop"
        android:layout_width="100dp"
        android:layout_height="wrap_content"
        android:layout_marginStart="102dp"
        android:layout_marginTop="152dp"
        android:layout_marginEnd="152dp"
```

```
        android:layout_marginBottom="572dp"
        android:text="End  Task  "
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.0471"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.053"
        android:layout_marginLeft="102dp"
        android:layout_marginRight="152dp" />


    <TextView
        android:id="@+id/txtmarquee"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text="Demonstration of Asynchronous Task !!!!"
        android:textSize="20sp"
        android:textStyle="bold"
        android:padding="10dp"
        android:textColor="@color/colorAccent"

        android:singleLine="true"
        android:ellipsize="marquee"
        android:marqueeRepeatLimit="marquee_forever"
        android:scrollHorizontally="true"

        android:layout_marginStart="50dp"
        android:layout_marginTop="250dp"
        android:layout_marginEnd="152dp"
        android:layout_marginBottom="572dp"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.0471"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.053"
        android:visibility="invisible"

        android:layout_marginLeft="50dp"
        android:layout_marginRight="152dp" />

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

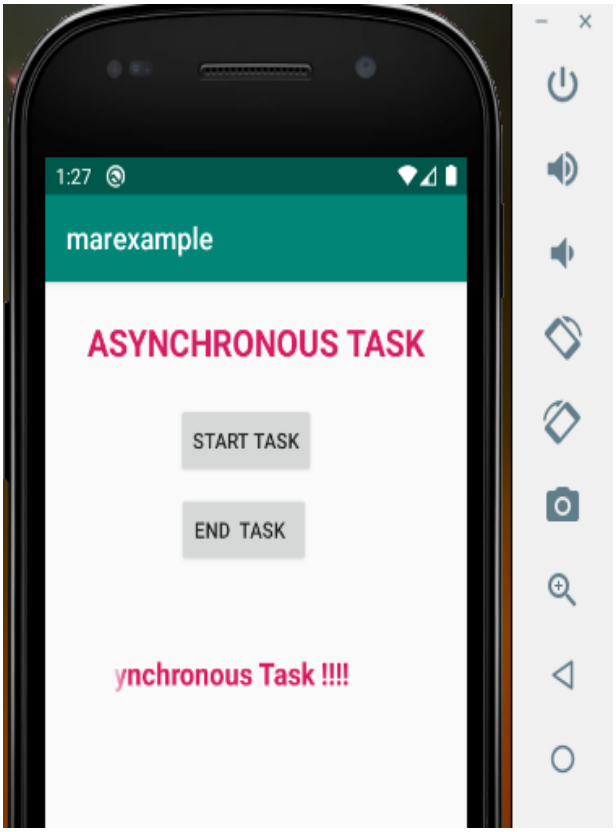
Following is the content of the modified src/MainActivity.java

MainActivity.java

```
package com.example.marexample;

import androidx.appcompat.app.AppCompatActivity;

import android.annotation.SuppressLint;
import android.os.AsyncTask;
import android.os.Bundle;
import android.view.View;
import android.widget.Button;
import android.widget.TextView;
import android.widget.Toast;

public class MainActivity extends AppCompatActivity {

    TextView txtmarq;
    Button btnstart, btnstop;
```

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

        txtmarq = findViewById(R.id.txtmarquee);

        btnstart = findViewById(R.id.buttonstart);
        btnstart.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {

                ExampleAsyncTask task = new ExampleAsyncTask();
                task.execute();

            }
        });

        btnstop = findViewById(R.id.buttonstop);
        btnstop.setOnClickListener(new View.OnClickListener() {

            @Override
            public void onClick(View v) {
                txtmarq.setSelected(false);
                txtmarq.setVisibility(View.INVISIBLE);
            }
        });
    }

    private class ExampleAsyncTask extends AsyncTask<String, String, String>
    {

        @Override
        protected void onPreExecute() {
            super.onPreExecute();
            Toast.makeText(getBaseContext(),"Async Task
Started!!!!!!!!",Toast.LENGTH_SHORT).show();
        }


        @Override
        protected String doInBackground(String... strings) {

            try {
                Thread.sleep(250);
            } catch (InterruptedException e) {
                e.printStackTrace();
            }
            return null;
        }


        @Override
        protected void onPostExecute(String s) {
            super.onPostExecute(s);

            txtmarq.setVisibility(View.VISIBLE);
            txtmarq.setSelected(true);
        }
    }

}
```

Output:



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.

First, create the android application as discussed in "Create your First Android Application". Following is the content of the modified res/layout/activity_main.xml.

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:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text="CLIPBOARD ACTIVITY"
        android:textColor="@color/colorAccent"
        android:textSize="18sp"
        android:textStyle="bold"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintHorizontal_bias="0.453"
        app:layout_constraintLeft_toLeftOf="parent"
        app:layout_constraintRight_toRightOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.053" />
```

```
    <EditText
        android:id="@+id/copy"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="49dp"
        android:layout_marginTop="80dp"
        android:layout_marginEnd="109dp"
        android:layout_marginBottom="596dp"
        android:ems="10"
        android:inputType="textPersonName"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.071"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.053" />

    <EditText
        android:id="@+id/paste"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="49dp"
        android:layout_marginTop="146dp"
        android:layout_marginEnd="109dp"
        android:layout_marginBottom="500dp"
        android:ems="10"
        android:inputType="textPersonName"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.071"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.053" />

    <Button
        android:id="@+id/buttoncopy"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="42dp"
        android:layout_marginTop="223dp"
        android:layout_marginEnd="261dp"
        android:layout_marginBottom="450dp"
        android:text="  Copy  Text "
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.071"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.053"/>

    <Button
        android:id="@+id/buttonpaste"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="166dp"
        android:layout_marginTop="223dp"
        android:layout_marginEnd="110dp"
        android:layout_marginBottom="450dp"
        android:text="Paste Text"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.071"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.053"/>

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

Following is the content of the modified src/MainActivity.java

MainActivity.java

```
package com.example.lab7b;

import androidx.appcompat.app.AppCompatActivity;

import android.content.ClipData;
import android.content.ClipboardManager;
import android.os.Bundle;
import android.view.View;
import android.widget.Button;
import android.widget.EditText;

public class MainActivity extends AppCompatActivity {

    private EditText copyText, pasteText;
    Button btncopy, btnpaste;

    private ClipboardManager cbm;
    private ClipData cd;

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

        copyText = findViewById(R.id.copy);
        pasteText = findViewById(R.id.paste);

        btncopy = findViewById(R.id.buttoncopy);
        btnpaste = findViewById(R.id.buttonpaste);

        cbm = (ClipboardManager) getSystemService(CLIPBOARD_SERVICE);

        btncopy.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {

                String text = copyText.getText().toString();
                cd = ClipData.newPlainText("text",text);
                cbm.setPrimaryClip(cd);
            }
        });

        btnpaste.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View view) {
                ClipData cd2 = cbm.getPrimaryClip();
                ClipData.Item item = cd2.getItemAt(0);
                String copied = item.getText().toString();
                pasteText.setText(copied);

            }
        });
    }
}
```

Output:

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.

First, create the android application as discussed in "Create your First Android Application". Following is the content of the modified res/layout/activity_main.xml.

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:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text="CAR EMI CALCULATOR"
        android:textColor="@color/colorAccent"
        android:textSize="18sp"
        android:textStyle="bold"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintHorizontal_bias="0.437"
        app:layout_constraintLeft_toLeftOf="parent"
        app:layout_constraintRight_toRightOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.053" />


    <TextView
        android:id="@+id/textView"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="100dp"
        android:layout_marginTop="103dp"
        android:layout_marginEnd="303dp"
        android:layout_marginBottom="609dp"
        android:text="Principal Amount:"
        android:textSize="16sp"
        android:textStyle="bold"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.437"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.053"
        android:layout_marginLeft="100dp"
        android:layout_marginRight="303dp" />

    <EditText
        android:id="@+id/editTextpa"
        android:layout_width="150dp"
        android:layout_height="wrap_content"
        android:layout_marginStart="150dp"
        android:layout_marginTop="86dp"
        android:layout_marginBottom="600dp"
        android:ems="10"
        android:inputType="number"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintHorizontal_bias="0.437"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.053"
        android:layout_marginLeft="150dp" />


    <TextView
        android:id="@+id/textView1"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="82dp"
        android:layout_marginTop="155dp"
        android:layout_marginEnd="303dp"
        android:layout_marginBottom="609dp"
```

```
        android:text="Down Amount:"
        android:textSize="16sp"
        android:textStyle="bold"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.437"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.053"
        android:layout_marginLeft="82dp"
        android:layout_marginRight="303dp" />

    <EditText
        android:id="@+id/editTextdp"
        android:layout_width="150dp"
        android:layout_height="wrap_content"
        android:layout_marginStart="150dp"
        android:layout_marginTop="138dp"
        android:layout_marginBottom="600dp"
        android:ems="10"
        android:inputType="number"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintHorizontal_bias="0.437"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.053"
        android:layout_marginLeft="150dp" />

    <TextView
        android:id="@+id/textViewir"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="80dp"
        android:layout_marginTop="207dp"
        android:layout_marginEnd="303dp"
        android:layout_marginBottom="609dp"
        android:text="Interest Rate:"
        android:textSize="16sp"
        android:textStyle="bold"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.437"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.053"
        android:layout_marginLeft="80dp"
        android:layout_marginRight="303dp" />

    <EditText
        android:id="@+id/editTextir"
        android:layout_width="150dp"
        android:layout_height="wrap_content"
        android:layout_marginStart="150dp"
        android:layout_marginTop="190dp"
        android:layout_marginBottom="600dp"
        android:ems="10"
        android:inputType="number"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintHorizontal_bias="0.437"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.053"
        android:layout_marginLeft="150dp" />

    <TextView
        android:id="@+id/textViewlt"
        android:layout_width="wrap_content"
```

```
        android:layout_height="wrap_content"
        android:layout_marginStart="90dp"
        android:layout_marginTop="268dp"
        android:layout_marginEnd="303dp"
        android:layout_marginBottom="609dp"
        android:text=" Loan Term(mths):"
        android:textSize="16sp"
        android:textStyle="bold"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.437"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.053"
        android:layout_marginLeft="90dp"
        android:layout_marginRight="303dp" />

    <EditText
        android:id="@+id/editTextIt"
        android:layout_width="150dp"
        android:layout_height="wrap_content"
        android:layout_marginStart="148dp"
        android:layout_marginTop="245dp"
        android:layout_marginBottom="600dp"
        android:ems="10"
        android:inputType="number"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintHorizontal_bias="0.437"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.053"
        android:layout_marginLeft="148dp" />

    <Button
        android:id="@+id/button"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="158dp"
        android:layout_marginTop="280dp"
        android:layout_marginEnd="184dp"
        android:layout_marginBottom="170dp"
        android:text="Calculate Monthly EMI"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintHorizontal_bias="0.437"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.053"
        android:layout_marginLeft="158dp"
        android:layout_marginRight="184dp" />

    <TextView
        android:id="@+id/textViewResult"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="220dp"
        android:layout_marginTop="370dp"
        android:layout_marginEnd="303dp"
        android:layout_marginBottom="609dp"
        android:text=" EMI: Result"
        android:textSize="16sp"
        android:textStyle="bold"
        android:textColor="@color/colorAccent"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.437"
        app:layout_constraintStart_toStartOf="parent"
```

```
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintVertical_bias="0.053"
        android:layout_marginLeft="220dp"
        android:layout_marginRight="303dp" />


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

Following is the content of the modified src/MainActivity.java

MainActivity.java

```
package com.example.aidldemo;

import androidx.appcompat.app.AppCompatActivity;

import android.app.IntentService;
import android.content.ComponentName;
import android.content.Intent;
import android.content.ServiceConnection;
import android.os.Bundle;
import android.os.IBinder;
import android.os.RemoteException;
import android.view.View;
import android.widget.Button;
import android.widget.EditText;
import android.widget.TextView;
import android.widget.Toast;

public class MainActivity extends AppCompatActivity  {

    ICarService cService;
    EditText prinamt, downamt, intrate,loanterm;
    Button calculateemi;
    TextView txtresult;

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

        prinamt = findViewById(R.id.editTextpa);
        downamt = findViewById(R.id.editTextdp);
        intrate = findViewById(R.id.editTextir);
        loanterm = findViewById(R.id.editTextlt);

        calculateemi = findViewById(R.id.button);

        txtresult = findViewById(R.id.textViewResult);
        calculateemi.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {

                Float principalamount = Float.valueOf(prinamt.getText().toString());
                Float downpayment = Float.valueOf(downamt.getText().toString());
                Float interestrate = Float.valueOf(intrate.getText().toString());
                int lnterm = Integer.parseInt(loanterm.getText().toString());

                try {
                    Float result =
cService.carcal(principalamount,downpayment,interestrate,lnterm);
                    txtresult.setText("Monthly EMI in Rs is :" +result);
                } catch (RemoteException e) {
                    e.printStackTrace();
                }
```

```
            }
        });

        Intent it = new Intent(this,CarService.class);
        bindService(it,sconnection,BIND_AUTO_CREATE);
    }

    ServiceConnection sconnection = new ServiceConnection() {
        @Override
        public void onServiceConnected(ComponentName name, IBinder service) {
            Toast.makeText(getBaseContext(),"Service
Connected",Toast.LENGTH_LONG).show();
            cService = ICarService.Stub.asInterface(service);
        }

        @Override
        public void onServiceDisconnected(ComponentName name) {

        }
    };

}
```

Navigate to Android view. Right click on app → New → AIDL → AIDL file. Save the interface as ICarService.aidl. Following is the modified content of the file ICarService.aidl

ICarService.aidl

```
// ICarService.aidl
package com.example.aidldemo;

// Declare any non-default types here with import statements

interface ICarService {
    float carcal(in float pa, in float dp, in float ir, in int lt);
}
```

Create a new java class file and name it as CarService.java. Following is the content of src/CarService.java

CarService.java

```
package com.example.aidldemo;

import android.app.Service;
import android.content.Intent;
import android.os.IBinder;
import android.os.RemoteException;

public class CarService extends Service {
    public CarService() {
    }

    @Override
    public IBinder onBind(Intent intent) {
        // TODO: Return the communication channel to the service.
        return stub;
    }

    ICarService.Stub stub = new ICarService.Stub() {
```

```
        @Override
        public float carcal(float pa, float dp, float ir, int lt) throws
RemoteException {
            float emiamount;
            float principalamt = pa - dp;  //Subtract downpayment from principal
amount
            float Interest = ((ir/12)/100);            //Convert interest for permonth
and divide it by 100 to get a number

            emiamount = (float) ((float) (principalamt * Interest ) *
(Math.pow((1+Interest),lt)) / ((Math.pow((1+Interest),lt)) - 1));

            return emiamount;
        }
    };
}
```

Output: