**Ex. No. : 02 Date :**

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**Simple Calculator**

**Aim**

Develop a simple calculator to perform arithmetic and mathematical functions using Math class.

***Procedure:***

**Step 1 :** File → New Project  
 Provide the application name (e.g., "Calculator") and click “Next”.

**Step 2 :** Select the target Android devices  
 Select the minimum SDK to run the application. Click “Next”.

**Step 3 :** Choose the activity for the application  
 By default, choose “Blank Activity”. Click “Next”.

**Step 4 :** Enter activity name and click “Finish”.

**Step 5 :** Edit the program

Design a calculator UI in activity\_main.xml using Buttons and TextViews.

Implement calculator logic in MainActivity.kt (eg.Addition,Subtractions.,)  
**Step 6 :** Run the application  
 Two ways to run the application:

1. Running through emulator  
  
 2. Running through mobile device

***AndroidManifest.xml***

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

**<manifest xmlns:android="http://schemas.android.com/apk/res/android"**

**xmlns:tools="http://schemas.android.com/tools">**

**<application**

**android:allowBackup="true"**

**android:dataExtractionRules="@xml/data\_extraction\_rules"**

**android:fullBackupContent="@xml/backup\_rules"**

**android:icon="@mipmap/ic\_launcher"**

**android:label="@string/app\_name"**

**android:roundIcon="@mipmap/ic\_launcher\_round"**

**android:supportsRtl="true"**

**android:theme="@style/Theme.CALCULATOR"**

**tools:targetApi="31">**

**<activity**

**android:name=".MainActivity"**

**android:exported="true">**

**<intent-filter>**

**<action android:name="android.intent.action.MAIN" />**

**<category android:name="android.intent.category.LAUNCHER" />**

**</intent-filter>**

**</activity>**

**</application>**

**</manifest>**

***Activity\_main.xml***

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

**<LinearLayout xmlns:android="http://schemas.android.com/apk/res/android"**

**xmlns:tools="http://schemas.android.com/tools"**

**android:layout\_width="match\_parent"**

**android:layout\_height="match\_parent"**

**android:background="#3F51B5"**

**android:orientation="vertical"**

**tools:context=".MainActivity">**

**<TextView**

**android:id="@+id/titleTextView"**

**android:layout\_width="match\_parent"**

**android:layout\_height="wrap\_content"**

**android:background="#5C6BC0"**

**android:gravity="center"**

**android:padding="8dp"**

**android:text="Simple Calculator"**

**android:textColor="#FFFFFF"**

**android:textSize="24sp"**

**android:textStyle="bold" />**

**<LinearLayout**

**android:layout\_width="match\_parent"**

**android:layout\_height="0dp"**

**android:layout\_weight="2"**

**android:background="#FFFFFF"**

**android:orientation="vertical"**

**android:padding="16dp">**

**<TextView**

**android:id="@+id/expressionTextView"**

**android:layout\_width="match\_parent"**

**android:layout\_height="wrap\_content"**

**android:ellipsize="end"**

**android:gravity="end"**

**android:maxLines="2"**

**android:padding="8dp"**

**android:textColor="#757575"**

**android:textSize="22sp" />**

**<TextView**

**android:id="@+id/resultTextView"**

**android:layout\_width="match\_parent"**

**android:layout\_height="wrap\_content"**

**android:ellipsize="end"**

**android:gravity="end"**

**android:maxLines="1"**

**android:padding="8dp"**

**android:textColor="#212121"**

**android:textSize="36sp"**

**android:textStyle="bold" />**

**</LinearLayout>**

**<LinearLayout**

**android:layout\_width="match\_parent"**

**android:layout\_height="0dp"**

**android:layout\_weight="5"**

**android:background="#3F51B5"**

**android:orientation="vertical"**

**android:padding="4dp">**

**<!-- Scientific function buttons -->**

**<LinearLayout**

**android:layout\_width="match\_parent"**

**android:layout\_height="0dp"**

**android:layout\_weight="1"**

**android:orientation="horizontal">**

**<Button**

**android:id="@+id/btnSin"**

**android:layout\_width="0dp"**

**android:layout\_height="match\_parent"**

**android:layout\_margin="2dp"**

**android:layout\_weight="1"**

**android:backgroundTint="#5C6BC0"**

**android:text="sin"**

**android:textColor="#FFFFFF"**

**android:textSize="18sp" />**

**<Button**

**android:id="@+id/btnCos"**

**android:layout\_width="0dp"**

**android:layout\_height="match\_parent"**

**android:layout\_margin="2dp"**

**android:layout\_weight="1"**

**android:backgroundTint="#5C6BC0"**

**android:text="cos"**

**android:textColor="#FFFFFF"**

**android:textSize="18sp" />**

**<Button**

**android:id="@+id/btnTan"**

**android:layout\_width="0dp"**

**android:layout\_height="match\_parent"**

**android:layout\_margin="2dp"**

**android:layout\_weight="1"**

**android:backgroundTint="#5C6BC0"**

**android:text="tan"**

**android:textColor="#FFFFFF"**

**android:textSize="18sp" />**

**<Button**

**android:id="@+id/btnLog"**

**android:layout\_width="0dp"**

**android:layout\_height="match\_parent"**

**android:layout\_margin="2dp"**

**android:layout\_weight="1"**

**android:backgroundTint="#5C6BC0"**

**android:text="log"**

**android:textColor="#FFFFFF"**

**android:textSize="18sp" />**

**</LinearLayout>**

**<!-- More scientific function buttons -->**

**<LinearLayout**

**android:layout\_width="match\_parent"**

**android:layout\_height="0dp"**

**android:layout\_weight="1"**

**android:orientation="horizontal">**

**<Button**

**android:id="@+id/btnSqrt"**

**android:layout\_width="0dp"**

**android:layout\_height="match\_parent"**

**android:layout\_margin="2dp"**

**android:layout\_weight="1"**

**android:backgroundTint="#5C6BC0"**

**android:text="√"**

**android:textColor="#FFFFFF"**

**android:textSize="24sp" />**

**<Button**

**android:id="@+id/btnPow"**

**android:layout\_width="0dp"**

**android:layout\_height="match\_parent"**

**android:layout\_margin="2dp"**

**android:layout\_weight="1"**

**android:backgroundTint="#5C6BC0"**

**android:text="x^y"**

**android:textColor="#FFFFFF"**

**android:textSize="18sp" />**

**<Button**

**android:id="@+id/btnMod"**

**android:layout\_width="0dp"**

**android:layout\_height="match\_parent"**

**android:layout\_margin="2dp"**

**android:layout\_weight="1"**

**android:backgroundTint="#5C6BC0"**

**android:text="%"**

**android:textColor="#FFFFFF"**

**android:textSize="24sp" />**

**<Button**

**android:id="@+id/btnClear"**

**android:layout\_width="0dp"**

**android:layout\_height="match\_parent"**

**android:layout\_margin="2dp"**

**android:layout\_weight="1"**

**android:backgroundTint="#FF5252"**

**android:text="C"**

**android:textColor="#FFFFFF"**

**android:textSize="24sp" />**

**</LinearLayout>**

**<!-- First row of number buttons -->**

**<LinearLayout**

**android:layout\_width="match\_parent"**

**android:layout\_height="0dp"**

**android:layout\_weight="1"**

**android:orientation="horizontal">**

**<Button**

**android:id="@+id/btn7"**

**android:layout\_width="0dp"**

**android:layout\_height="match\_parent"**

**android:layout\_margin="2dp"**

**android:layout\_weight="1"**

**android:backgroundTint="#7986CB"**

**android:text="7"**

**android:textColor="#FFFFFF"**

**android:textSize="24sp" />**

**<Button**

**android:id="@+id/btn8"**

**android:layout\_width="0dp"**

**android:layout\_height="match\_parent"**

**android:layout\_margin="2dp"**

**android:layout\_weight="1"**

**android:backgroundTint="#7986CB"**

**android:text="8"**

**android:textColor="#FFFFFF"**

**android:textSize="24sp" />**

**<Button**

**android:id="@+id/btn9"**

**android:layout\_width="0dp"**

**android:layout\_height="match\_parent"**

**android:layout\_margin="2dp"**

**android:layout\_weight="1"**

**android:backgroundTint="#7986CB"**

**android:text="9"**

**android:textColor="#FFFFFF"**

**android:textSize="24sp" />**

**<Button**

**android:id="@+id/btnDivide"**

**android:layout\_width="0dp"**

**android:layout\_height="match\_parent"**

**android:layout\_margin="2dp"**

**android:layout\_weight="1"**

**android:backgroundTint="#5C6BC0"**

**android:text="/"**

**android:textColor="#FFFFFF"**

**android:textSize="24sp" />**

**</LinearLayout>**

**<!-- Second row of number buttons -->**

**<LinearLayout**

**android:layout\_width="match\_parent"**

**android:layout\_height="0dp"**

**android:layout\_weight="1"**

**android:orientation="horizontal">**

**<Button**

**android:id="@+id/btn4"**

**android:layout\_width="0dp"**

**android:layout\_height="match\_parent"**

**android:layout\_margin="2dp"**

**android:layout\_weight="1"**

**android:backgroundTint="#7986CB"**

**android:text="4"**

**android:textColor="#FFFFFF"**

**android:textSize="24sp" />**

**<Button**

**android:id="@+id/btn5"**

**android:layout\_width="0dp"**

**android:layout\_height="match\_parent"**

**android:layout\_margin="2dp"**

**android:layout\_weight="1"**

**android:backgroundTint="#7986CB"**

**android:text="5"**

**android:textColor="#FFFFFF"**

**android:textSize="24sp" />**

**<Button**

**android:id="@+id/btn6"**

**android:layout\_width="0dp"**

**android:layout\_height="match\_parent"**

**android:layout\_margin="2dp"**

**android:layout\_weight="1"**

**android:backgroundTint="#7986CB"**

**android:text="6"**

**android:textColor="#FFFFFF"**

**android:textSize="24sp" />**

**<Button**

**android:id="@+id/btnMultiply"**

**android:layout\_width="0dp"**

**android:layout\_height="match\_parent"**

**android:layout\_margin="2dp"**

**android:layout\_weight="1"**

**android:backgroundTint="#5C6BC0"**

**android:text="\*"**

**android:textColor="#FFFFFF"**

**android:textSize="24sp" />**

**</LinearLayout>**

**<!-- Third row of number buttons -->**

**<LinearLayout**

**android:layout\_width="match\_parent"**

**android:layout\_height="0dp"**

**android:layout\_weight="1"**

**android:orientation="horizontal">**

**<Button**

**android:id="@+id/btn1"**

**android:layout\_width="0dp"**

**android:layout\_height="match\_parent"**

**android:layout\_margin="2dp"**

**android:layout\_weight="1"**

**android:backgroundTint="#7986CB"**

**android:text="1"**

**android:textColor="#FFFFFF"**

**android:textSize="24sp" />**

**<Button**

**android:id="@+id/btn2"**

**android:layout\_width="0dp"**

**android:layout\_height="match\_parent"**

**android:layout\_margin="2dp"**

**android:layout\_weight="1"**

**android:backgroundTint="#7986CB"**

**android:text="2"**

**android:textColor="#FFFFFF"**

**android:textSize="24sp" />**

**<Button**

**android:id="@+id/btn3"**

**android:layout\_width="0dp"**

**android:layout\_height="match\_parent"**

**android:layout\_margin="2dp"**

**android:layout\_weight="1"**

**android:backgroundTint="#7986CB"**

**android:text="3"**

**android:textColor="#FFFFFF"**

**android:textSize="24sp" />**

**<Button**

**android:id="@+id/btnSubtract"**

**android:layout\_width="0dp"**

**android:layout\_height="match\_parent"**

**android:layout\_margin="2dp"**

**android:layout\_weight="1"**

**android:backgroundTint="#5C6BC0"**

**android:text="-"**

**android:textColor="#FFFFFF"**

**android:textSize="24sp" />**

**</LinearLayout>**

**<!-- Fourth row of buttons -->**

**<LinearLayout**

**android:layout\_width="match\_parent"**

**android:layout\_height="0dp"**

**android:layout\_weight="1"**

**android:orientation="horizontal">**

**<Button**

**android:id="@+id/btnDecimal"**

**android:layout\_width="0dp"**

**android:layout\_height="match\_parent"**

**android:layout\_margin="2dp"**

**android:layout\_weight="1"**

**android:backgroundTint="#7986CB"**

**android:text="."**

**android:textColor="#FFFFFF"**

**android:textSize="24sp" />**

**<Button**

**android:id="@+id/btn0"**

**android:layout\_width="0dp"**

**android:layout\_height="match\_parent"**

**android:layout\_margin="2dp"**

**android:layout\_weight="1"**

**android:backgroundTint="#7986CB"**

**android:text="0"**

**android:textColor="#FFFFFF"**

**android:textSize="24sp" />**

**<Button**

**android:id="@+id/btnNegate"**

**android:layout\_width="0dp"**

**android:layout\_height="match\_parent"**

**android:layout\_margin="2dp"**

**android:layout\_weight="1"**

**android:backgroundTint="#7986CB"**

**android:text="+/-"**

**android:textColor="#FFFFFF"**

**android:textSize="18sp" />**

**<Button**

**android:id="@+id/btnAdd"**

**android:layout\_width="0dp"**

**android:layout\_height="match\_parent"**

**android:layout\_margin="2dp"**

**android:layout\_weight="1"**

**android:backgroundTint="#5C6BC0"**

**android:text="+"**

**android:textColor="#FFFFFF"**

**android:textSize="24sp" />**

**</LinearLayout>**

**<!-- Equals and Delete buttons -->**

**<LinearLayout**

**android:layout\_width="match\_parent"**

**android:layout\_height="0dp"**

**android:layout\_weight="1"**

**android:orientation="horizontal">**

**<Button**

**android:id="@+id/btnDelete"**

**android:layout\_width="0dp"**

**android:layout\_height="match\_parent"**

**android:layout\_margin="2dp"**

**android:layout\_weight="1"**

**android:backgroundTint="#FFA726"**

**android:text="DEL"**

**android:textColor="#FFFFFF"**

**android:textSize="18sp" />**

**<Button**

**android:id="@+id/btnEquals"**

**android:layout\_width="0dp"**

**android:layout\_height="match\_parent"**

**android:layout\_margin="2dp"**

**android:layout\_weight="3"**

**android:backgroundTint="#4CAF50"**

**android:text="="**

**android:textColor="#FFFFFF"**

**android:textSize="24sp" />**

**</LinearLayout>**

**</LinearLayout>**

**</LinearLayout>**

***MainActivity.kt***

**package com.example.calculator**

**import android.os.Bundle**

**import android.view.View**

**import android.widget.Button**

**import android.widget.TextView**

**import android.widget.Toast**

**import android.appcompat.app.AppCompatActivity**

**import kotlin.math.\***

**class MainActivity : AppCompatActivity() {**

**// Use lazy initialization to ensure views are found after setContentView**

**private val resultTextView by lazy { findViewById<TextView>(R.id.resultTextView) }**

**private val expressionTextView by lazy { findViewById<TextView>(R.id.expressionTextView) }**

**private var lastNumber: Double = 0.0**

**private var currentOperation: String = ""**

**private var isNewOperation: Boolean = true**

**override fun onCreate(savedInstanceState: Bundle?) {**

**super.onCreate(savedInstanceState)**

**setContentView(R.layout.activity\_main)**

**// Views are automatically initialized through lazy properties**

**// Initialize number buttons**

**setupNumberButtons()**

**// Setup operation buttons**

**setupOperationButtons()**

**// Setup special function buttons**

**setupFunctionButtons()**

**// Setup other buttons**

**setupOtherButtons()**

**}**

**private fun setupNumberButtons() {**

**val numberButtons = arrayOf(**

**findViewById<Button>(R.id.btn0),**

**findViewById<Button>(R.id.btn1),**

**findViewById<Button>(R.id.btn2),**

**findViewById<Button>(R.id.btn3),**

**findViewById<Button>(R.id.btn4),**

**findViewById<Button>(R.id.btn5),**

**findViewById<Button>(R.id.btn6),**

**findViewById<Button>(R.id.btn7),**

**findViewById<Button>(R.id.btn8),**

**findViewById<Button>(R.id.btn9)**

**)**

**numberButtons.forEach { button ->**

**button.setOnClickListener {**

**if (isNewOperation) {**

**resultTextView.text = ""**

**isNewOperation = false**

**}**

**val numberText = resultTextView.text.toString()**

**val buttonText = button.text.toString()**

**resultTextView.text = numberText + buttonText**

**updateExpressionView()**

**}**

**}**

**// Setup decimal point button**

**findViewById<Button>(R.id.btnDecimal).setOnClickListener {**

**if (isNewOperation) {**

**resultTextView.text = "0."**

**isNewOperation = false**

**} else if (!resultTextView.text.contains(".")) {**

**resultTextView.text = resultTextView.text.toString() + "."**

**}**

**updateExpressionView()**

**}**

**}**

**private fun setupOperationButtons() {**

**// Basic arithmetic operations**

**val operationButtons = mapOf(**

**R.id.btnAdd to "+",**

**R.id.btnSubtract to "-",**

**R.id.btnMultiply to "\*",**

**R.id.btnDivide to "/",**

**R.id.btnMod to "%"**

**)**

**operationButtons.forEach { (id, operator) ->**

**findViewById<Button>(id).setOnClickListener {**

**if (resultTextView.text.isNotEmpty()) {**

**lastNumber = resultTextView.text.toString().toDouble()**

**currentOperation = operator**

**isNewOperation = true**

**updateExpressionView()**

**}**

**}**

**}**

**// Equals button**

**findViewById<Button>(R.id.btnEquals).setOnClickListener {**

**if (resultTextView.text.isNotEmpty() && currentOperation.isNotEmpty()) {**

**val secondNumber = resultTextView.text.toString().toDouble()**

**val result = performOperation(lastNumber, secondNumber, currentOperation)**

**resultTextView.text = formatResult(result)**

**expressionTextView.text = formatResult(lastNumber) + " " + currentOperation + " " + formatResult(secondNumber) + " = " + formatResult(result)**

**lastNumber = result**

**currentOperation = ""**

**isNewOperation = true**

**}**

**}**

**}**

**private fun setupFunctionButtons() {**

**// Scientific functions**

**findViewById<Button>(R.id.btnSin).setOnClickListener { applyFunction("sin") }**

**findViewById<Button>(R.id.btnCos).setOnClickListener { applyFunction("cos") }**

**findViewById<Button>(R.id.btnTan).setOnClickListener { applyFunction("tan") }**

**findViewById<Button>(R.id.btnLog).setOnClickListener { applyFunction("log") }**

**findViewById<Button>(R.id.btnSqrt).setOnClickListener { applyFunction("sqrt") }**

**findViewById<Button>(R.id.btnPow).setOnClickListener {**

**if (resultTextView.text.isNotEmpty()) {**

**lastNumber = resultTextView.text.toString().toDouble()**

**currentOperation = "^"**

**isNewOperation = true**

**updateExpressionView()**

**}**

**}**

**}**

**private fun setupOtherButtons() {**

**// Clear button**

**findViewById<Button>(R.id.btnClear).setOnClickListener {**

**resultTextView.text = ""**

**expressionTextView.text = ""**

**lastNumber = 0.0**

**currentOperation = ""**

**isNewOperation = true**

**}**

**// Delete button (backspace)**

**findViewById<Button>(R.id.btnDelete).setOnClickListener {**

**val text = resultTextView.text.toString()**

**if (text.isNotEmpty()) {**

**resultTextView.text = text.substring(0, text.length - 1)**

**updateExpressionView()**

**}**

**}**

**// +/- button (change sign)**

**findViewById<Button>(R.id.btnNegate).setOnClickListener {**

**if (resultTextView.text.isNotEmpty()) {**

**val value = resultTextView.text.toString().toDouble() \* -1**

**resultTextView.text = formatResult(value)**

**updateExpressionView()**

**}**

**}**

**}**

**private fun applyFunction(function: String) {**

**if (resultTextView.text.isNotEmpty()) {**

**val value = resultTextView.text.toString().toDouble()**

**val result = when (function) {**

**"sin" -> sin(Math.toRadians(value))**

**"cos" -> cos(Math.toRadians(value))**

**"tan" -> tan(Math.toRadians(value))**

**"log" -> log10(value)**

**"sqrt" -> sqrt(value)**

**else -> value**

**}**

**resultTextView.text = formatResult(result)**

**expressionTextView.text = "$function($value) = ${formatResult(result)}"**

**lastNumber = result**

**isNewOperation = true**

**} else {**

**Toast.makeText(this, "Enter a number first", Toast.LENGTH\_SHORT).show()**

**}**

**}**

**private fun performOperation(first: Double, second: Double, operation: String): Double {**

**return when (operation) {**

**"+" -> first + second**

**"-" -> first - second**

**"\*" -> first \* second**

**"/" -> first / second**

**"%" -> first % second**

**"^" -> first.pow(second)**

**else -> second**

**}**

**}**

**private fun formatResult(result: Double): String {**

**return if (result == result.toInt().toDouble()) {**

**result.toInt().toString()**

**} else {**

**result.toString()**

**}**

**}**

**private fun updateExpressionView() {**

**if (currentOperation.isEmpty()) {**

**expressionTextView.text = resultTextView.text**

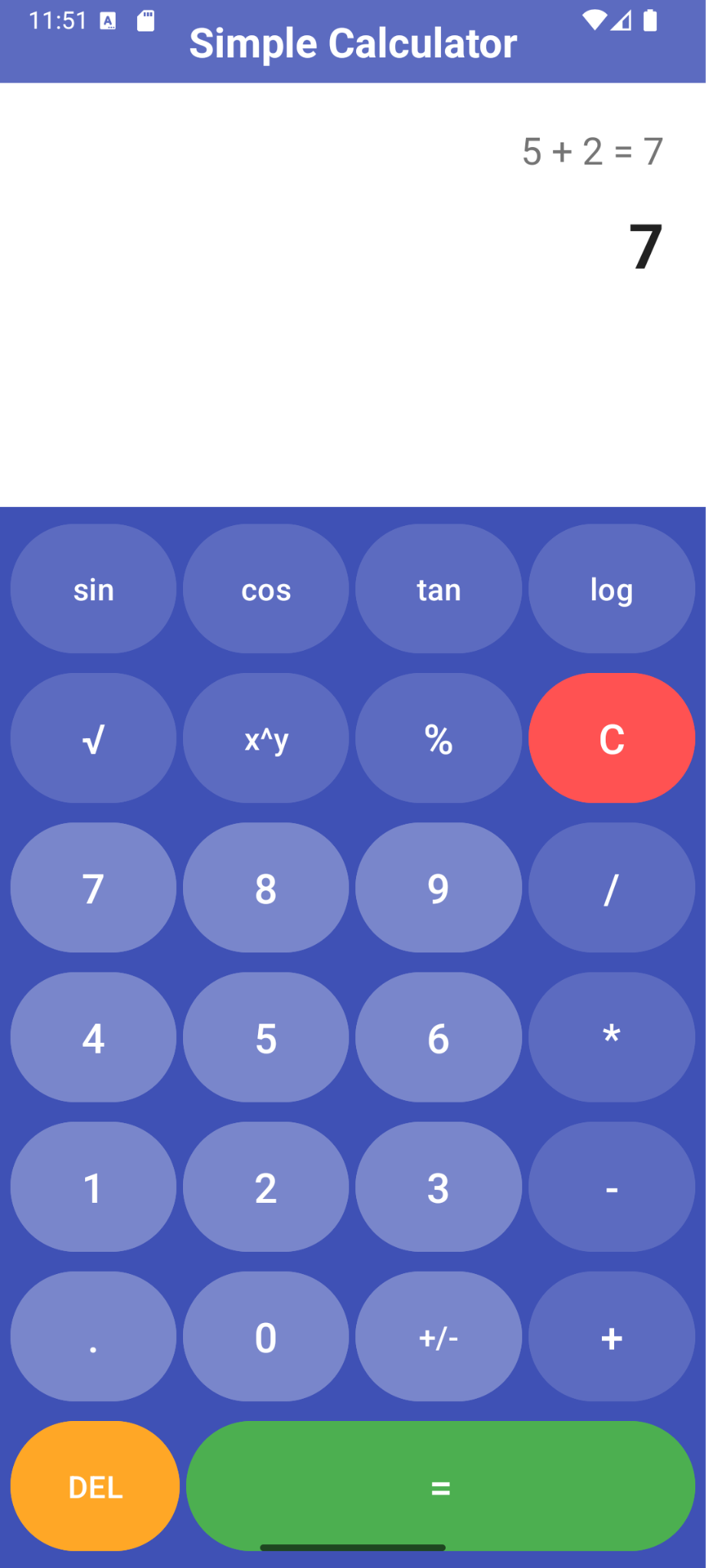
**} else {**

**expressionTextView.text = "${formatResult(lastNumber)} $currentOperation ${resultTextView.text}"**

**}**

**}}**

***Output***

******

**Result:**

The Calculator application successfully takes input, performs arithmetic operations, and displays results correctly on an emulator or mobile device.