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()) {
```

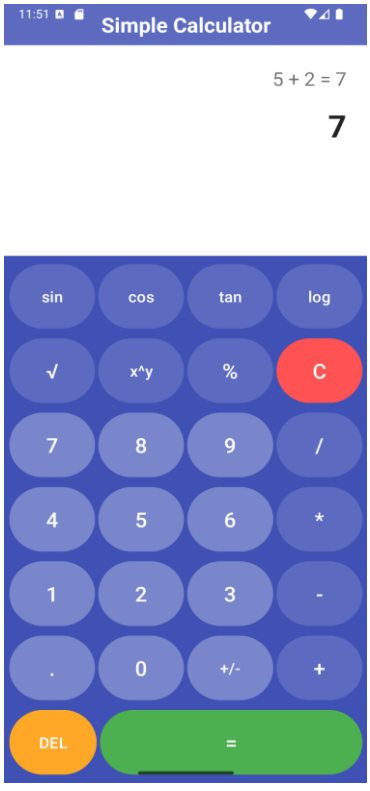
```
                val secondNumber = resultTextView.text.toString().toDouble()

                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.