ST Lab 5

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Create an android application to make a simple calculator, which performs Addition, Subtraction, Multiplication, and Division.

activity_main.xml

```
<?xml version="1.0" encoding="utf-8"?>
<RelativeLayout
xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:tools="http://schemas.android.com/tools"
    android:id="@+id/relative1"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:padding="16dp"
    tools:context=".MainActivity">

    <EditText
        android:id="@+id/edt1"
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        android:gravity="right"
        android:inputType="number"
        android:textSize="28dp"/>

    <RelativeLayout
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_centerInParent="true">


        <Button
            android:id="@+id/button1"
            style="?android:attr/buttonStyleSmall"
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:layout_alignEnd="@+id/button4"
            android:layout_alignRight="@+id/button4"
            android:text="1" />

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

```
        style="?android:attr/buttonStyleSmall"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_alignTop="@+id/button1"
        android:layout_toStartOf="@+id/button3"
        android:layout_toLeftOf="@+id/button3"
        android:text="2" />

    <Button
        android:id="@+id/button3"
        style="?android:attr/buttonStyleSmall"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_alignTop="@+id/button2"
        android:layout_centerHorizontal="true"
        android:text="3" />

    <Button
        android:id="@+id/button4"
        style="?android:attr/buttonStyleSmall"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_below="@+id/button1"
        android:layout_toLeftOf="@+id/button2"
        android:text="4" />

    <Button
        android:id="@+id/button5"
        style="?android:attr/buttonStyleSmall"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_alignStart="@+id/button2"
        android:layout_alignLeft="@+id/button2"
        android:layout_alignBottom="@+id/button4"
        android:text="5" />

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

```
        <Button
            android:id="@+id/button7"
            style="?android:attr/buttonStyleSmall"
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:layout_below="@+id/button4"
            android:layout_toLeftOf="@+id/button2"
            android:text="7" />

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

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

        <Button
            android:id="@+id/buttonadd"
            style="?android:attr/buttonStyleSmall"
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:layout_alignTop="@+id/button3"
            android:layout_alignParentEnd="true"
            android:layout_marginStart="46dp"
            android:layout_toEndOf="@+id/button3"
            android:text="+" />

        <Button
            android:id="@+id/buttonsub"
            style="?android:attr/buttonStyleSmall"
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:layout_below="@+id/buttonadd"
```

```
        android:layout_alignStart="@+id/buttonadd"
        android:layout_alignEnd="@+id/buttonadd"
        android:layout_alignParentEnd="true"
        android:text="-" />

    <Button
        android:id="@+id/buttonmul"
        style="?android:attr/buttonStyleSmall"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_below="@+id/buttonsub"
        android:layout_alignStart="@+id/buttonsub"
        android:layout_alignParentEnd="true"
        android:text="*" />

    <Button
        android:id="@+id/button10"
        style="?android:attr/buttonStyleSmall"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_below="@+id/button7"
        android:layout_toLeftOf="@+id/button2"
        android:text="." />

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

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

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

```
            style="?android:attr/buttonStyleSmall"
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:layout_below="@+id/buttonmul"
            android:layout_alignStart="@+id/buttonmul"
            android:layout_alignLeft="@+id/buttonmul"
            android:layout_alignEnd="@+id/buttonmul"
            android:layout_alignRight="@+id/buttonmul"
            android:text="/" />

        <Button
            android:id="@+id/buttoneql"
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:layout_below="@+id/button0"
            android:layout_alignStart="@+id/button10"
            android:layout_alignLeft="@+id/button10"
            android:layout_alignEnd="@+id/buttondiv"
            android:layout_alignRight="@+id/buttondiv"
            android:layout_marginTop="37dp"
            android:text="=" />
    </RelativeLayout>
</RelativeLayout>
```

MainActivity.java

```
package com.example.simplecalculator;

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

import androidx.appcompat.app.AppCompatActivity;

import java.math.BigDecimal;
import java.math.RoundingMode;

public class MainActivity extends AppCompatActivity {

    Button button0, button1, button2, button3, button4, button5,
button6,
            button7, button8, button9, buttonAdd, buttonSub,
buttonDivision,
```

```
            buttonMul, button10, buttonC, buttonEqual;
    EditText editText;

    private static double round(double value) {

        BigDecimal bd = BigDecimal.valueOf(value);
        bd = bd.setScale(4, RoundingMode.HALF_UP);
        return bd.doubleValue();
    }

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

        button0 = (Button) findViewById(R.id.button0);
        button1 = (Button) findViewById(R.id.button1);
        button2 = (Button) findViewById(R.id.button2);
        button3 = (Button) findViewById(R.id.button3);
        button4 = (Button) findViewById(R.id.button4);
        button5 = (Button) findViewById(R.id.button5);
        button6 = (Button) findViewById(R.id.button6);
        button7 = (Button) findViewById(R.id.button7);
        button8 = (Button) findViewById(R.id.button8);
        button9 = (Button) findViewById(R.id.button9);
        button10 = (Button) findViewById(R.id.button10);
        buttonAdd = (Button) findViewById(R.id.buttonadd);
        buttonSub = (Button) findViewById(R.id.buttonsub);
        buttonMul = (Button) findViewById(R.id.buttonmul);
        buttonDivision = (Button) findViewById(R.id.buttondiv);
        buttonC = (Button) findViewById(R.id.buttonC);
        buttonEqual = (Button) findViewById(R.id.buttoneql);
        editText = (EditText) findViewById(R.id.edt1);


        button1.setOnClickListener(v ->
editText.setText(editText.getText() + "1"));

        button2.setOnClickListener(v ->
editText.setText(editText.getText() + "2"));

        button3.setOnClickListener(v ->
editText.setText(editText.getText() + "3"));

        button4.setOnClickListener(v ->
editText.setText(editText.getText() + "4"));
```

```
        button5.setOnClickListener(v ->
editText.setText(editText.getText() + "5"));

        button6.setOnClickListener(v ->
editText.setText(editText.getText() + "6"));

        button7.setOnClickListener(v ->
editText.setText(editText.getText() + "7"));

        button8.setOnClickListener(v ->
editText.setText(editText.getText() + "8"));

        button9.setOnClickListener(v ->
editText.setText(editText.getText() + "9"));

        button0.setOnClickListener(v ->
editText.setText(editText.getText() + "0"));
        buttonAdd.setOnClickListener(v ->
editText.setText(editText.getText() + "+"));
        buttonSub.setOnClickListener(v ->
editText.setText(editText.getText() + "-"));
        buttonMul.setOnClickListener(v ->
editText.setText(editText.getText() + "*"));
        buttonDivision.setOnClickListener(v ->
editText.setText(editText.getText() + "/"));


        buttonEqual.setOnClickListener(v -> {
            try {

                double res =
Evaluator.eval(editText.getText().toString());
                res = round(res);
                editText.setText(Double.toString(res));
            } catch (Exception e) {
                Toast.makeText(this, "Error: " + e.getMessage(),
Toast.LENGTH_SHORT).show();
            }

        });

        buttonC.setOnClickListener(v -> editText.setText(""));

        button10.setOnClickListener(v ->
editText.setText(editText.getText() + "."));
```

```
    }
}
```

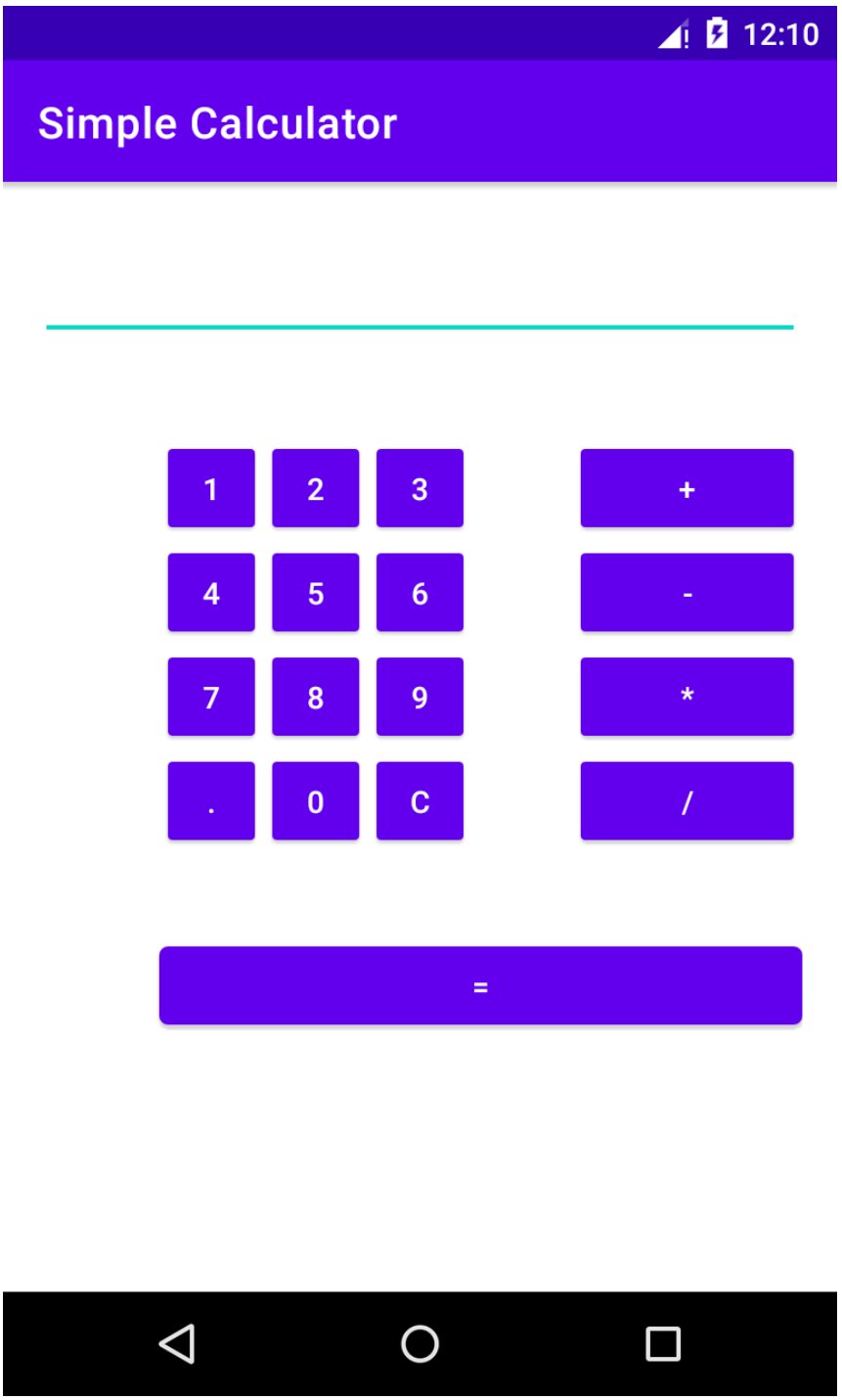
Evaluator.java

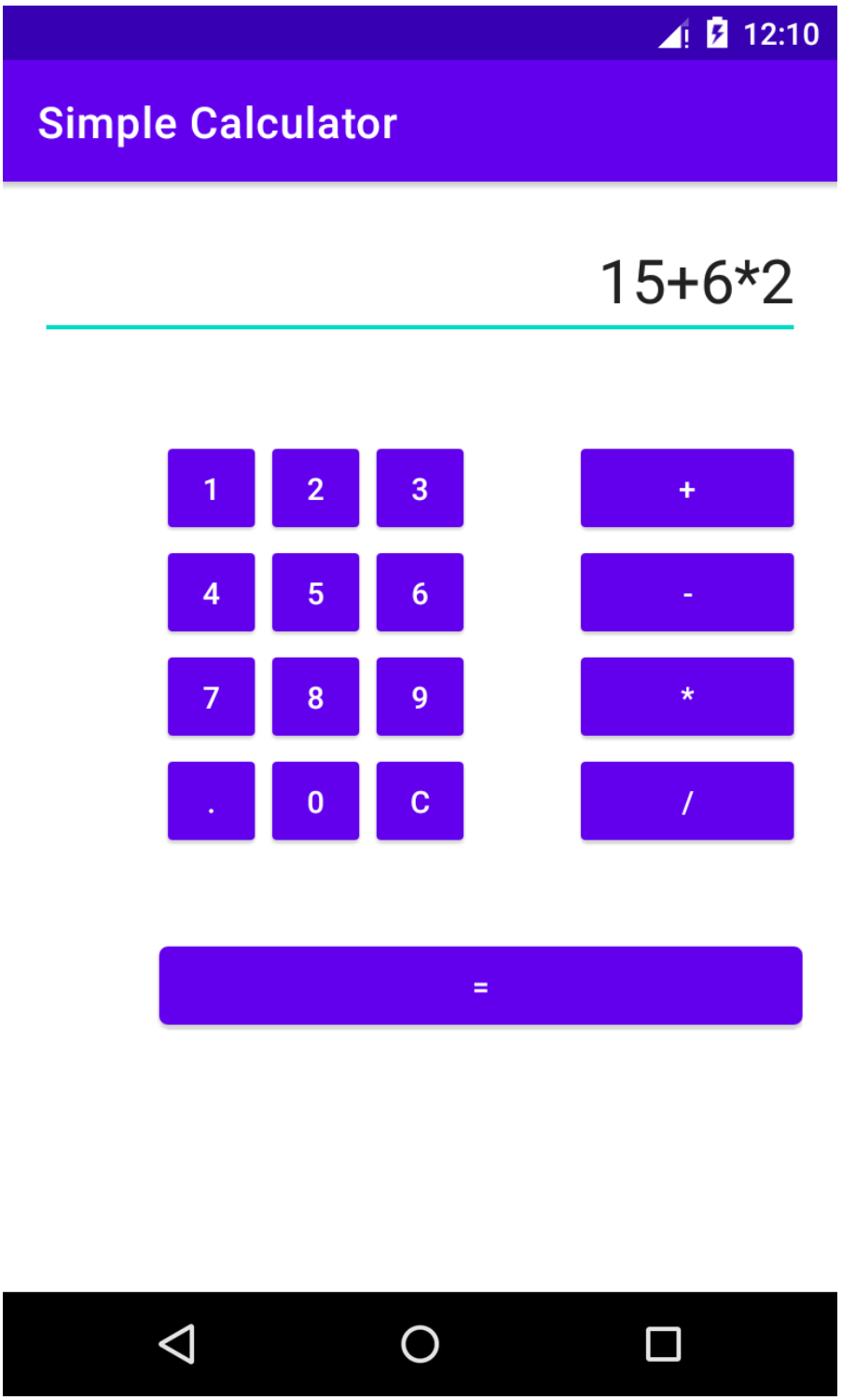
```
package com.example.simplecalculator;

public class Evaluator {
    public static double eval(final String str) {
        return new Object() {
            int pos = -1, ch;

            void nextChar() {
                ch = (++pos < str.length()) ? str.charAt(pos) : -1;
            }

            boolean eat(int charToEat) {
                while (ch == ' ') nextChar();
                if (ch == charToEat) {
                    nextChar();
                    return true;
                }
                return false;
            }

            double parse() {
                nextChar();
                double x = parseExpression();
                if (pos < str.length()) throw new
RuntimeException("Unexpected: " + (char) ch);
                return x;
            }

            // Grammar:
            // expression = term | expression `+` term | expression `-`
term
            // term = factor | term `*` factor | term `/` factor
            // factor = `+` factor | `-` factor | `(` expression `)`
            //        | number | functionName factor | factor `^` factor

            double parseExpression() {
                double x = parseTerm();
                for (; ; ) {
                    if (eat('+')) x += parseTerm(); // addition
```

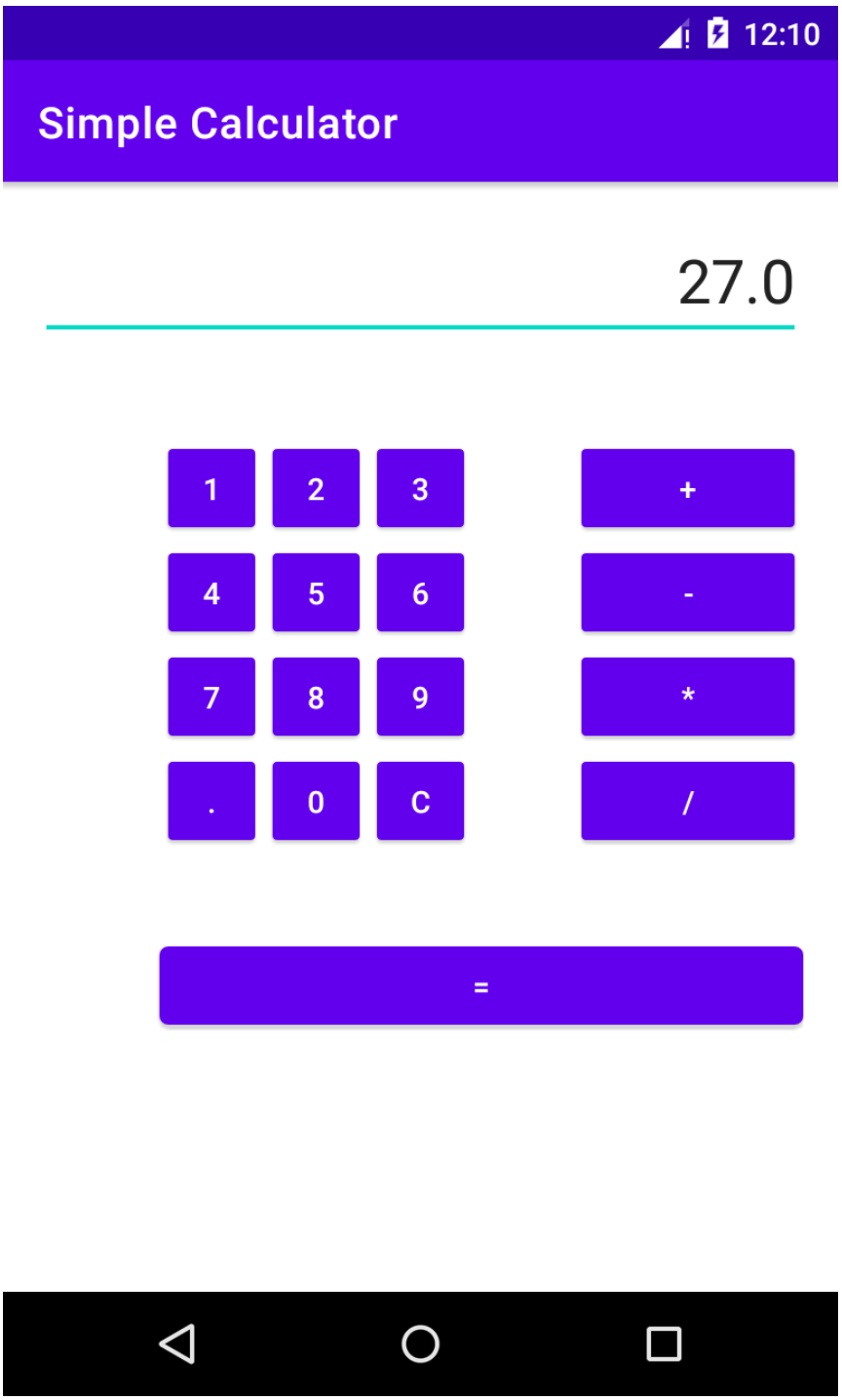
```
                else if (eat('-')) x -= parseTerm(); // subtraction
                else return x;
            }
        }

        double parseTerm() {
            double x = parseFactor();
            for (; ; ) {
                if (eat('*')) x *= parseFactor(); // multiplication
                else if (eat('/')) x /= parseFactor(); // division
                else return x;
            }
        }

        double parseFactor() {
            if (eat('+')) return parseFactor(); // unary plus
            if (eat('-')) return -parseFactor(); // unary minus

            double x;
            int startPos = this.pos;
            if (eat('(')) { // parentheses
                x = parseExpression();
                eat(')');
            } else if ((ch >= '0' && ch <= '9') || ch == '.') { //
numbers
                while ((ch >= '0' && ch <= '9') || ch == '.')
nextChar();
                x = Double.parseDouble(str.substring(startPos,
this.pos));
            } else if (ch >= 'a' && ch <= 'z') { // functions
                while (ch >= 'a' && ch <= 'z') nextChar();
                String func = str.substring(startPos, this.pos);
                x = parseFactor();
                if (func.equals("sqrt")) x = Math.sqrt(x);
                else if (func.equals("sin")) x =
Math.sin(Math.toRadians(x));
                else if (func.equals("cos")) x =
Math.cos(Math.toRadians(x));
                else if (func.equals("tan")) x =
Math.tan(Math.toRadians(x));
                else if (func.equals("sinh")) x = Math.sinh(x);
                else if (func.equals("cosh")) x = Math.sinh(x);
                else if (func.equals("tanh")) x = Math.sinh(x);
                else if (func.equals("exp")) x = Math.exp(x);
                else if (func.equals("log")) x = Math.log(x);
                else throw new RuntimeException("Unknown function: "
```

```
+ func);
                } else {
                    throw new RuntimeException("Unexpected: " + (char)
ch);
                }

                if (eat('^')) x = Math.pow(x, parseFactor()); //
exponentiation

                return x;
            }
        }.parse();
    }

}
```

Sample Calculation: Next Page


12:10
Simple Calculator
1
2
3
+
4
5
6
-
7
8
9
*
.
0
C
/
=


12:10
Simple Calculator
15+6*2
1
2
3
+
4
5
6
-
7
8
9
*
.
0
C
/
=


12:10
Simple Calculator
27.0
1
2
3
+
4
5
6
-
7
8
9
*
.
0
C
/
=

Error Handling