Android Studio

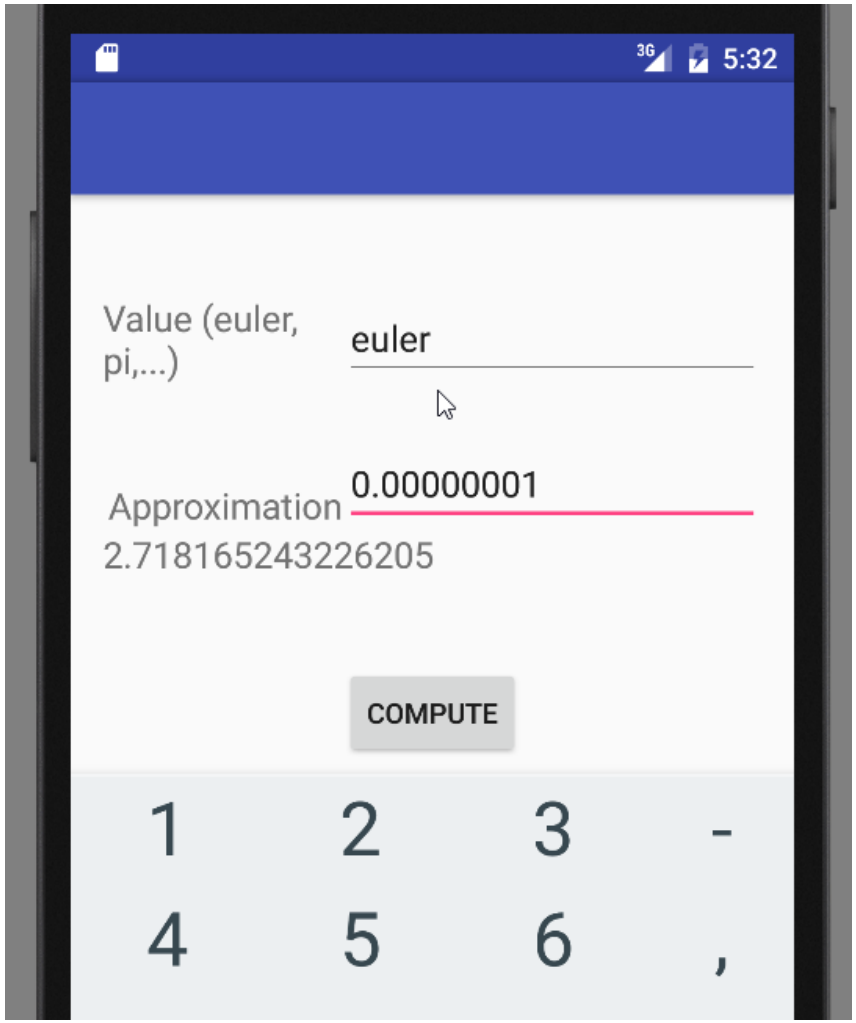
West University of Timisoara, Romania
Computer Science Department
IE3, Fall 2015
Dr. Liviu Octavian Mafteiu-Scai

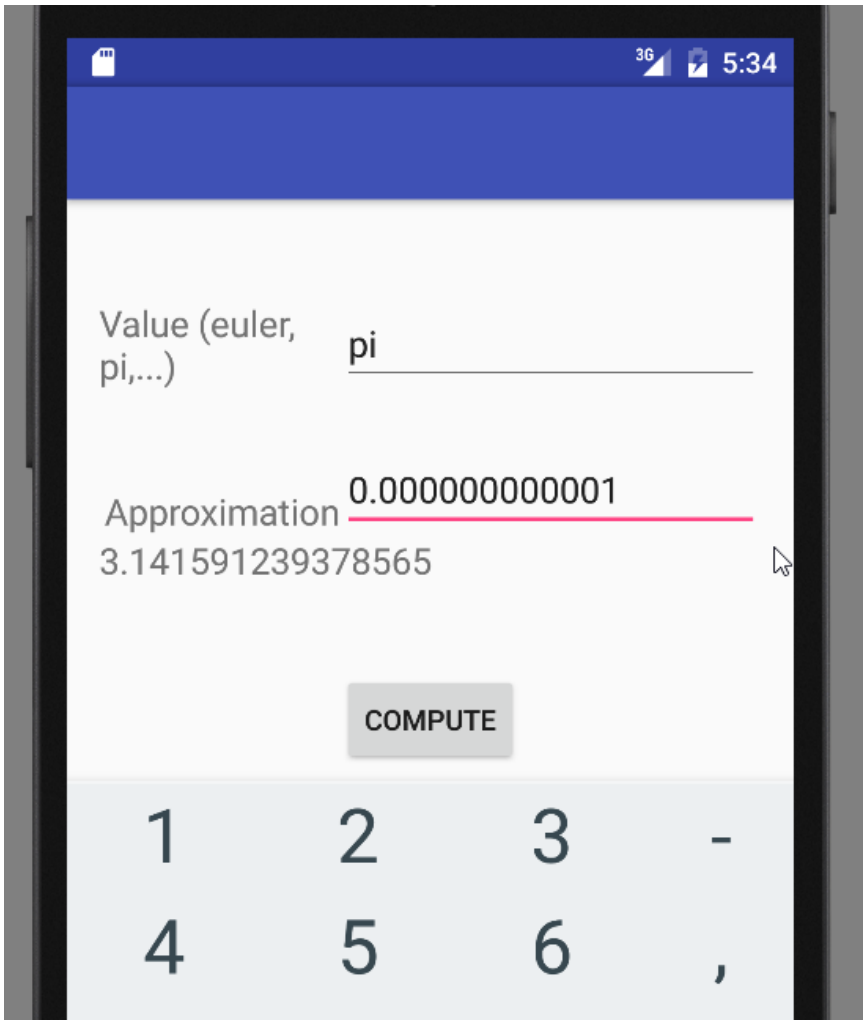
Input and Output operations

simple
numerical computations
using
mobile devices

Goal

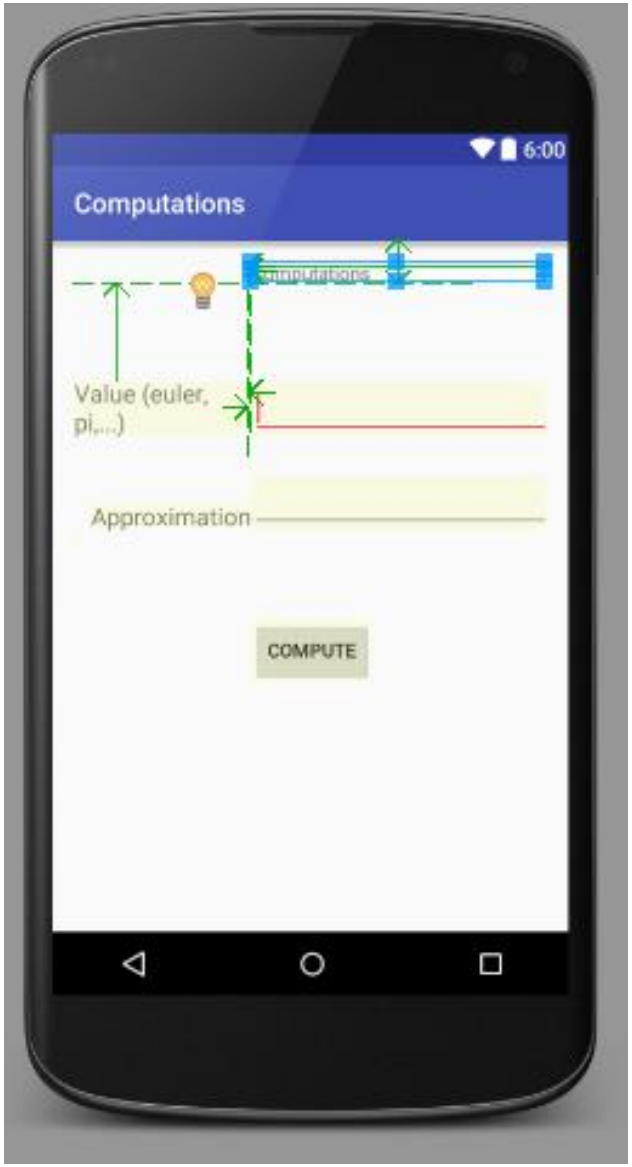
Computations App





Computations App

Layout -> ***content_main.xml*** file Design form



Computations App

Layout -> ***content_main.xml*** file Edit form

```
<RelativeLayout
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:paddingBottom="@dimen/activity_vertical_margin"
   android:paddingLeft="@dimen/activity_horizontal_margin"
   android:paddingRight="@dimen/activity_horizontal_margin"
   android:paddingTop="@dimen/activity_vertical_margin">

   <TextView
      android:id="@+id/textView1"
      android:layout_width="fill_parent"
      android:layout_height="wrap_content"
      android:text="Computations"
      android:layout_alignParentTop="true"
      android:layout_toRightOf="@+id/textView2"
      android:layout_toEndOf="@+id/textView2" />
```

RelativeLayout
is a view group that displays child views in relative positions, to one another.
vs. LinearLayout

paddingBottom in *dimens.xml* file
<dimen name="activity_horizontal_margin">16dp</dimen>

The constant ***fill_parent*** was replaced with ***match_parent*** in Android 2.2 .

Or, use the value ***–1***.

fill_parent ⇔that means that the view wants to be as big as its parent (minus padding)

wrap_content ⇔ some similar with "Autosize" from Windows Form Control.

toRightOf is a property of RelativeLayout it will have no effect in LinearLayout.
Positions the left edge of this view to the right of the given anchor view ID.

Layout -> ***content_main.xml*** file Edit form

```
<Button
   android:id="@+id/btnCompute"
   android:layout_width="wrap_content"
   android:layout_height="wrap_content"
   android:text="Compute"
   android:layout_below="@+id/txtResult"
   android:layout_centerHorizontal="true"
   android:layout_marginTop="43dp" />


<EditText
   android:id="@+id/txtApprox"
   android:layout_width="fill_parent"
   android:layout_height="wrap_content"
   android:ems="2"
   android:inputType="number|numberDecimal"
   android:layout_alignBottom="@+id/textView3"
   android:layout_alignLeft="@+id/txtValue"
   android:layout_alignStart="@+id/txtValue" />
```

In MainActivity.java file:
btnCompute = (Button)findViewById(R.id.*btnCompute*);

"Compute": the string on the button

In MainActivity.java file:
secondApprox = (EditText)findViewById(R.id.***txtApprox***);

ems is a typography term, that controls text size. The em is the font size.
In TextView there is an attribute named android:ems. The description is "Makes the TextView be exactly this many ems wide"

Computations App

Activity -> ***Main_Activity.java*** file

package name: launch the application using its package name.

A class for mapping from String values to various Parcelable types.

This class represents the basic building block for user interface components. A View occupies a rectangular area on the screen and is responsible for drawing and event handling. View is the base class for widgets, which are used to create interactive UI components (buttons, text fields, etc.).

```
package com.example.mafteiu_scai.computations;

import android.os.Bundle;
import android.view.View;
import android.view.View.OnClickListener;
import android.support.v7.app.AppCompatActivity;
import android.widget.Button;
import android.widget.EditText;
import android.widget.TextView;
```

Interface definition for a callback to be invoked when a view is clicked

Base class for activities that use the support library action bar features.

Represents a push-button widget. Push-buttons can be pressed or clicked by the user to perform an action.

Displays text to the user and optionally allows them to edit it.

EditText is a thin/layer over TextView that configures itself to be editable

Computations App

Activity -> ***Main_Activity.java*** file

Base class for activities that use the support Library action bar features, derived from:

java.lang.Object
↳android.content.Context
↳android.content.ContextWrapper
↳android.view.ContextThemeWrapper
↳android.app.Activity
↳android.support.v4.app.FragmentActivity
↳ android.support.v7.app.AppCompatActivity

```
public class MainActivity extends AppCompatActivity {

   // Variable Declaration

   EditText firstValue;
   EditText secondApprox;
   TextView computeResult;
   Button btnCompute;

   double approx, sum;
   String value;

   double prev_term;
   double curr_term;
   int n, i;
   double aux;
```

Variables from controls
In connection with *content_main.xml* file

corresponding variables of … used in java processing

Other variables used in computation

Computations App

Activity -> ***Main_Activity.java*** file

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

    firstValue = (EditText)findViewById(R.id.txtValue);
    secondApprox = (EditText)findViewById(R.id.txtApprox);
    computeResult = (TextView)findViewById(R.id.txtResult);
    btnCompute = (Button)findViewById(R.id.btnCompute);

btnCompute.setOnClickListener(new OnClickListener() {
public void onClick(View v) {
  value = firstValue.getText().toString();
  approx = double.parseDouble(secondApprox.getText().toString());
```

onCreate: a method that initialize the activity.

setContentView(int) with a layout resource define the UI

findViewById(int) is used to retrieve the widgets in UI, needed to interact with java program

Create click listener object

onClick, the method that will be invoked when the button is clicked.

converting String to Double in Android

getText() a method that can be used to get the copied text from the clipboard

Computations App

Activity -> ***Main_Activity.java*** file

Compare two string
Compares the given object to a string and returns true if they are equal.

```
if(value.equals("euler")) {     //e from ln
   double prev_term = 2;
   double curr_term = 1.5*1.5;
   n=2;
   while (curr_term - prev_term > approx) {
      prev_term = curr_term;
      n++;
      aux = 1 + 1.0/n;
      curr_term = aux;
      for(int j=2;j<=n;j++)
         curr_term *=aux;
   }
   sum = curr_term;
   computeResult.setText(Double.toString(sum));
}
```

Algorithm implementation for computing ***e*** constant (base of ln)

$$e = \lim_{n\to\infty}\left(1+\frac{1}{n}\right)^n$$

approximation equal with **approx**

Replace text in **computeResul**t (in TextView) with converted value of **sum**.

Computations App

Activity -> ***Main_Activity.java*** file

```
    if(value.equals("pi")) {   //pi
       double prev_term = 1;
       double curr_term = -1.0/3;
       sum = prev_term + curr_term;
       i=2;
       int sign=-1;
       while (Math.abs(prev_term) - Math.abs(curr_term)  > approx)
       {
          prev_term = curr_term;
          i++;
          sign *= (-1);
          curr_term = sign * 1.0 / (2*i-1);
          sum += curr_term;
       }
       sum = 4.0 * sum;
       computeResult.setText(Double.toString(sum));
    }
    else
       computeResult.setText("Incorrect string for Value");
}
```

PI computing algorithm

$$\pi = 4\sum_{k=0}^{\infty}\frac{(-1)^k}{2k+1} = \frac{4}{1} - \frac{4}{3} + \frac{4}{5} - \frac{4}{7} + \frac{4}{9} - \frac{4}{11}\cdots$$

Design and Implement an Android App for solving Quadratic Equations

Using the previsious example/app, compute ***sin*** function using the series:

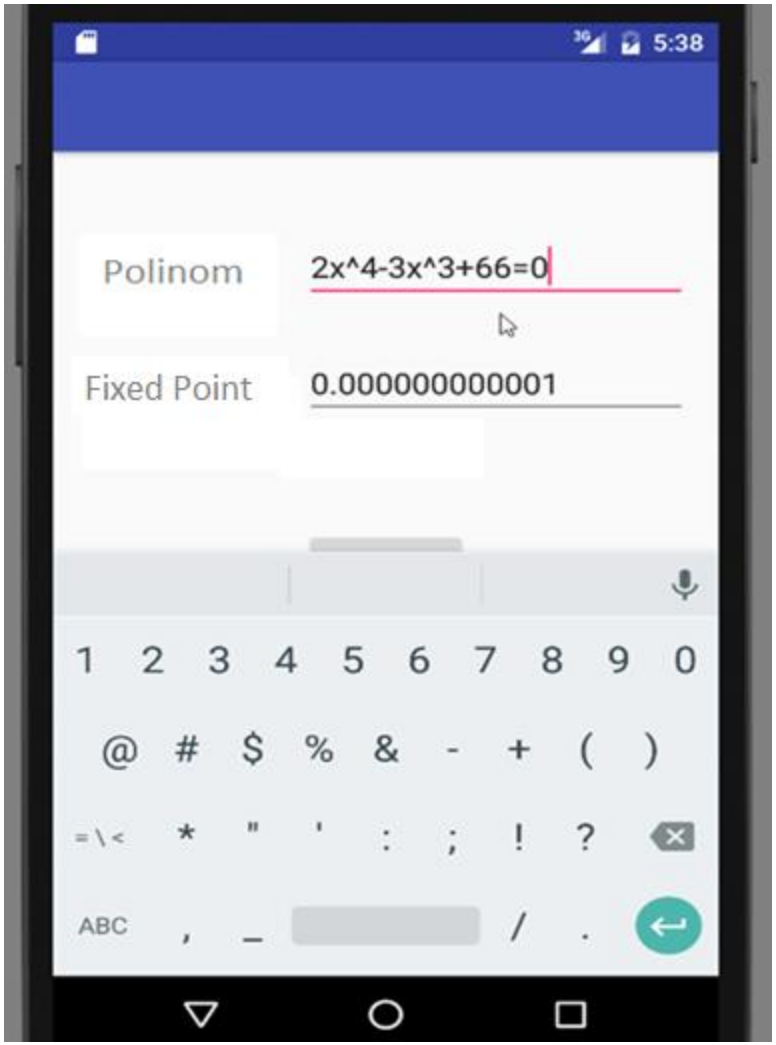
$$\sin\theta = \sum_{n=0}^{\infty} \frac{(-1)^n}{(2n+1)!}\theta^{2n+1} = \theta - \frac{\theta^3}{3!} + \frac{\theta^5}{5!} - \frac{\theta^7}{7!} + \cdots$$

where θ is the angle in radians. In clearer terms,

$$\sin\theta = \theta - \frac{\theta^3}{6} + \frac{\theta^5}{120} - \frac{\theta^7}{5040} + \cdots$$

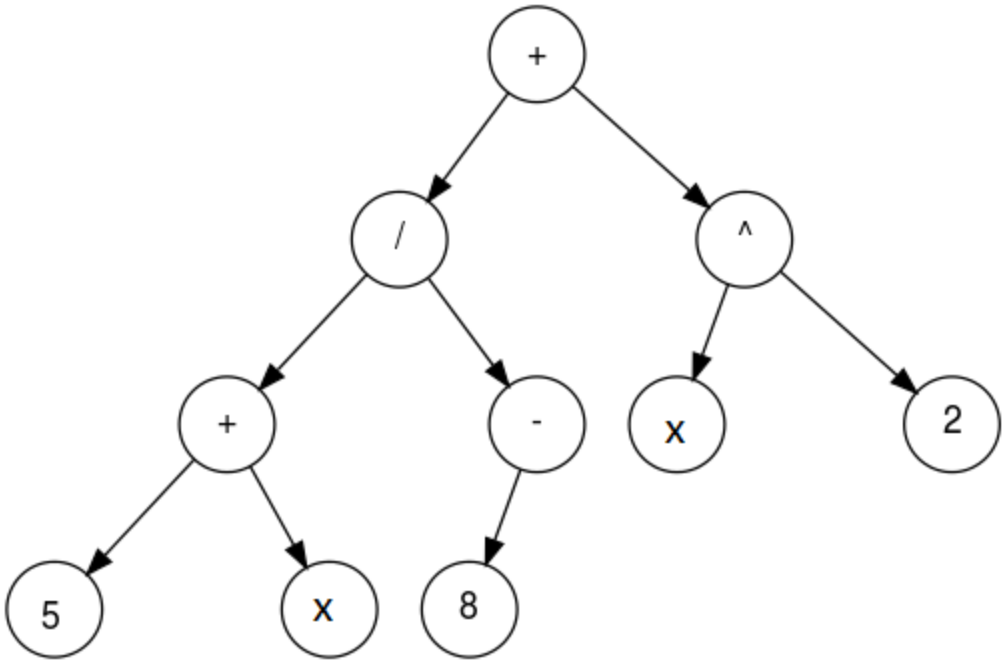
Computations App – lab activity 3

Modify the first given example to calculate the value of a polynomial in a fixed point



Computations App – lab activity 3

Compute polinom value for a fixed point x – first theoretical considerations



binary algebric expression tree equivalent to
((5x)/-8)+x^2

Compute polinom value for a fixed point x – second "theoretical" considerations

brute force

Ta-Ta for now!