

# App development in Android Studio

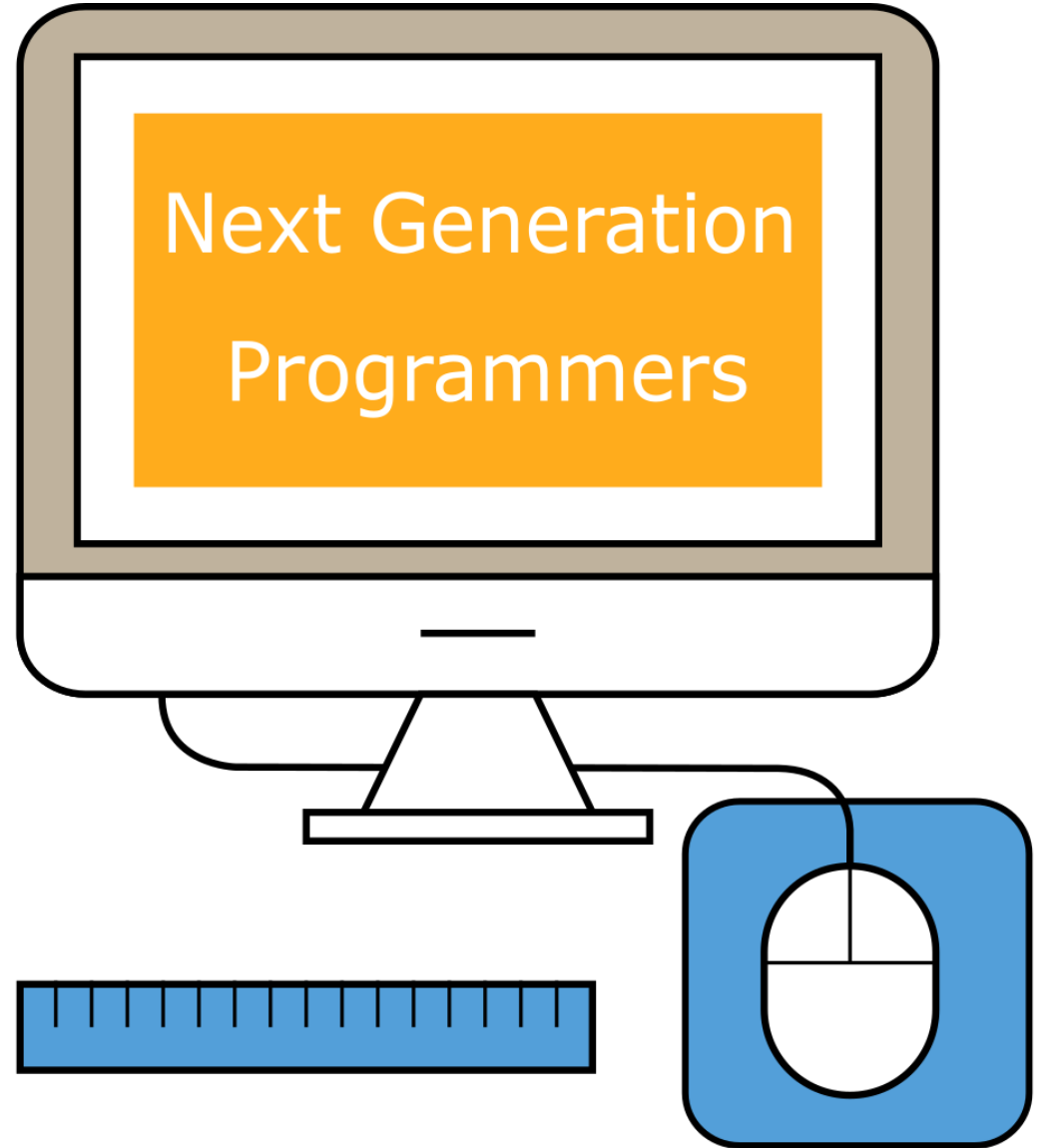
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David Azpiroz

June 2021



**Android**  
Studio



# Helpful glossary



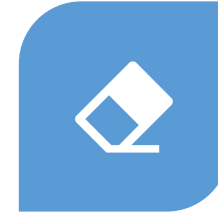
UI / GUI / HMI



DEVELOPMENT



IMPLEMENT



EDIT



TEST



RUN

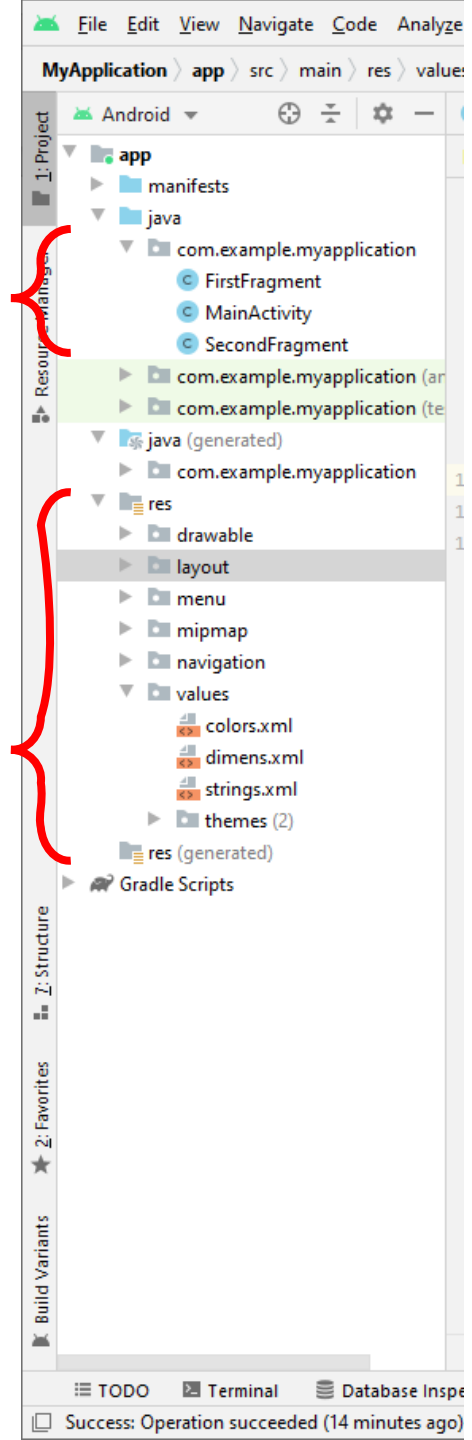
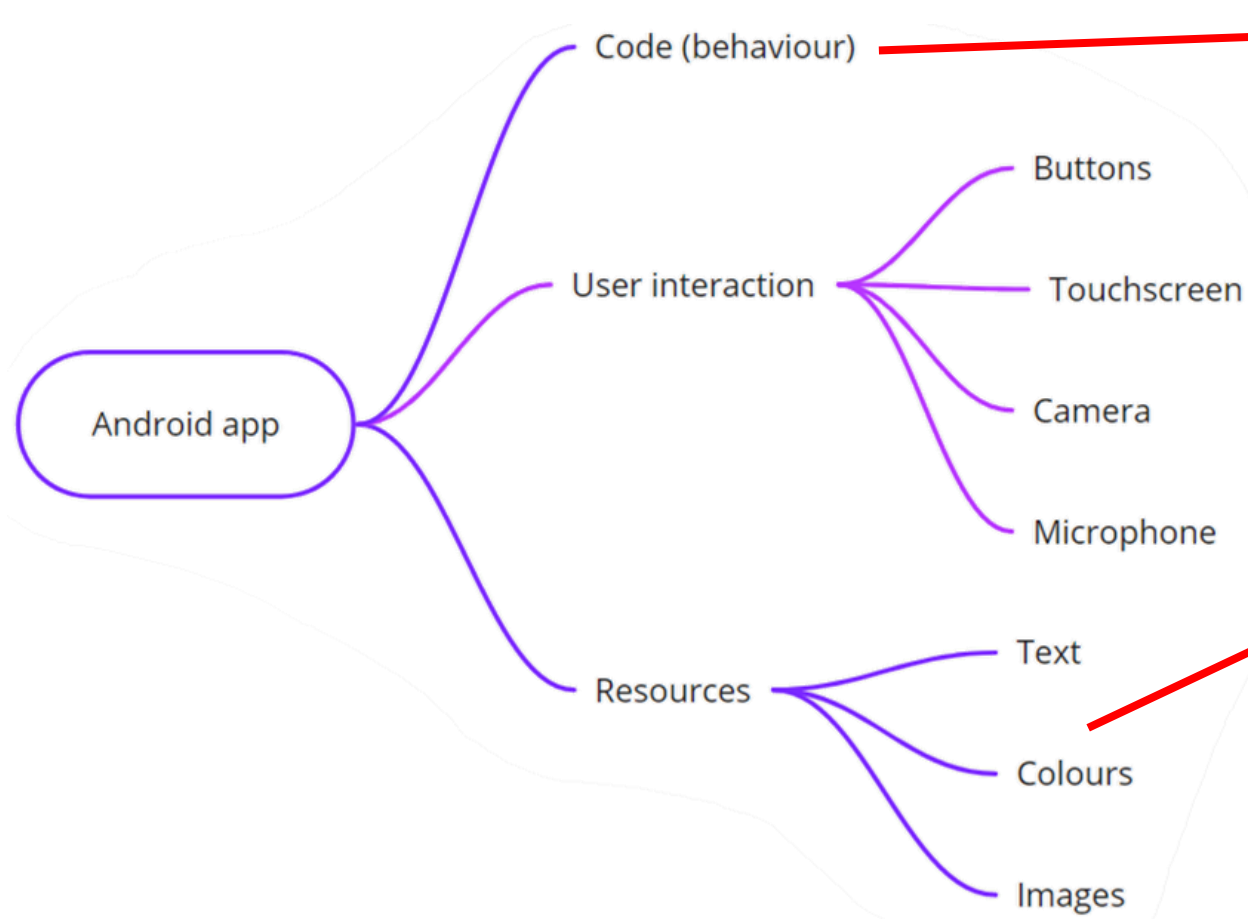


DEBUG



RECAP

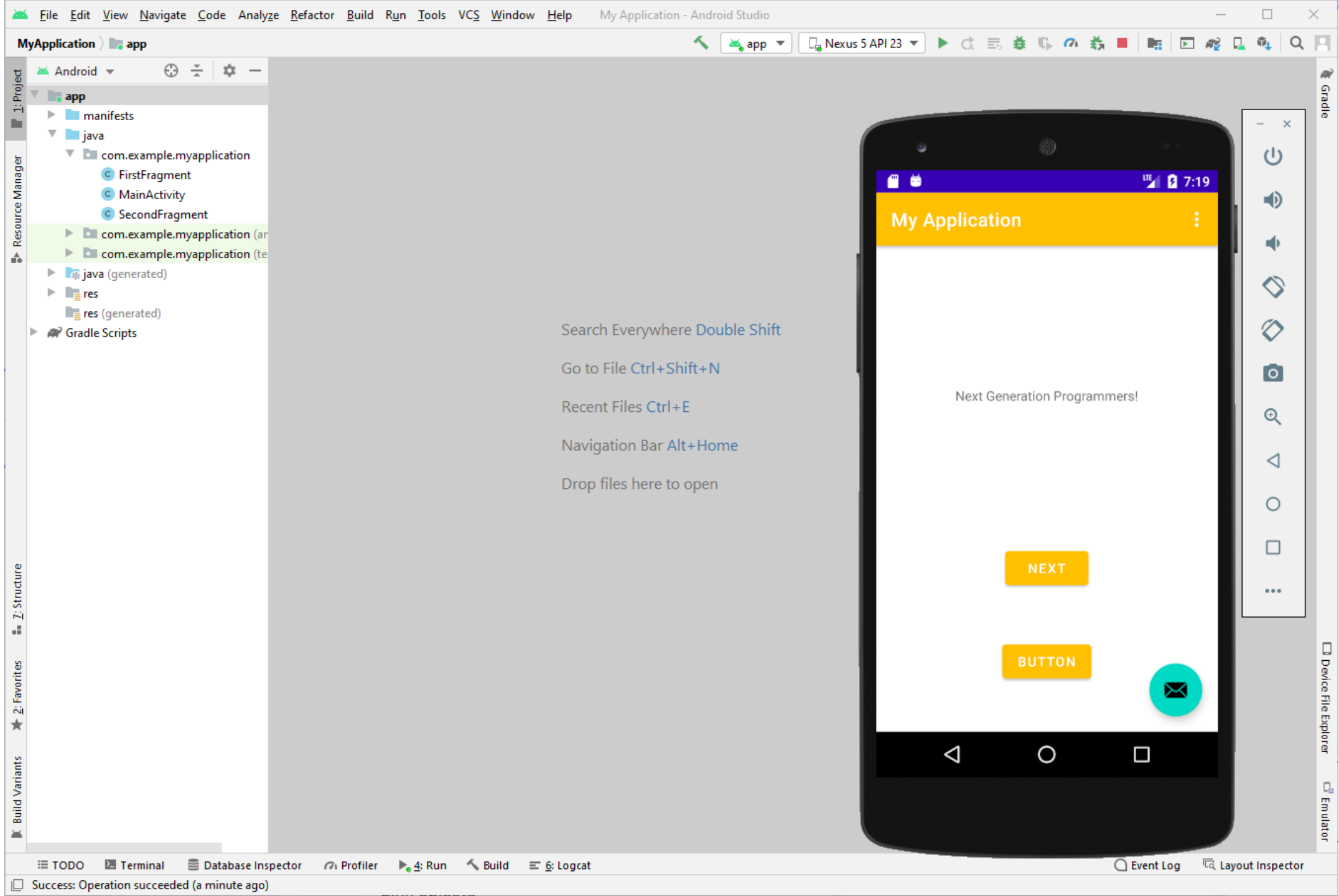
# Recap



Function

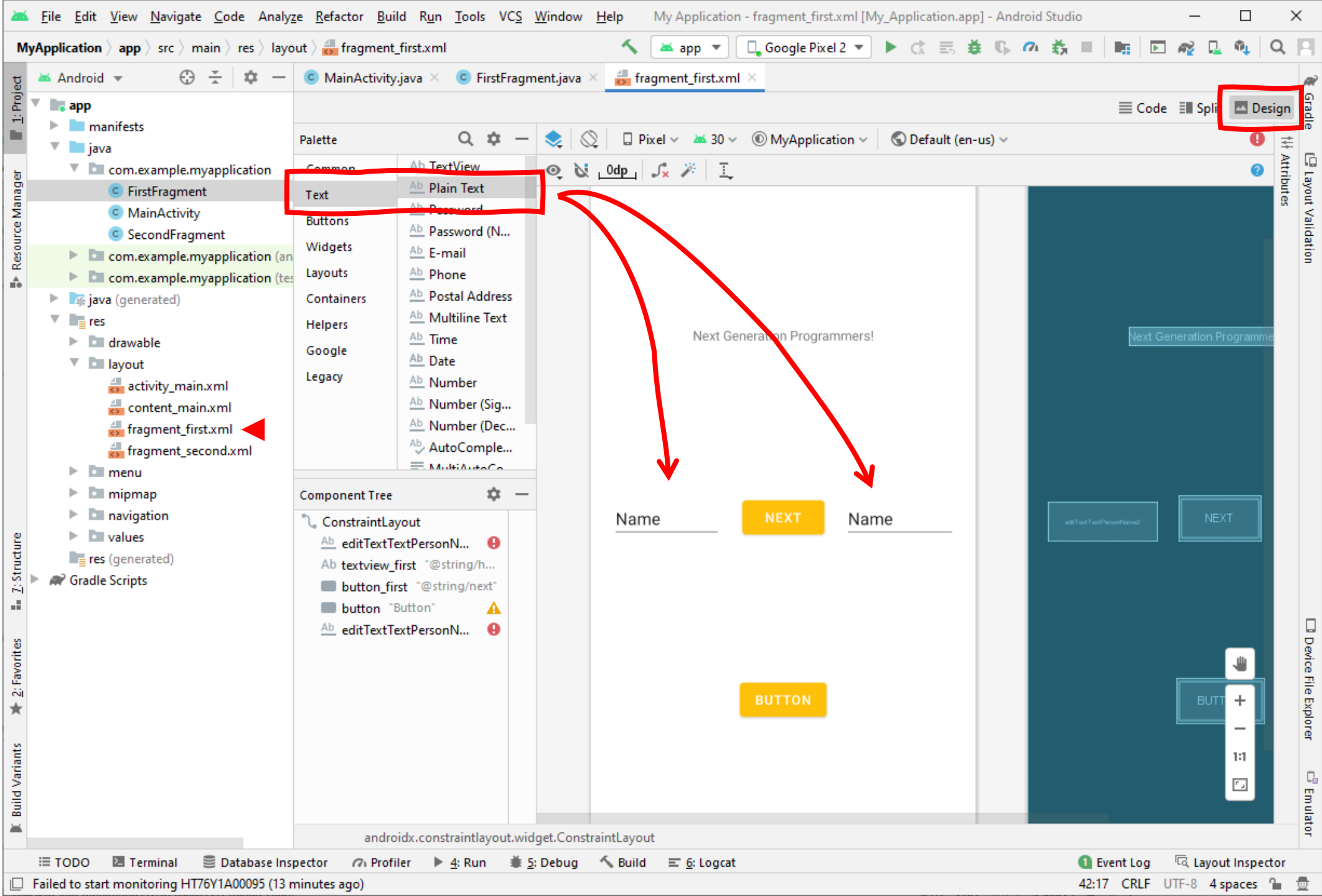
```
1 package com.example.myapplication;
2
3 import android.os.Bundle;
4 import com.google.android.material.floatingactionbutton.FloatingActionButton;
5 import com.google.android.material.snackbar.Snackbar;
6 import androidx.appcompat.app.AppCompatActivity;
7 import androidx.appcompat.widget.Toolbar;
8 import android.view.View;
9 import android.view.Menu;
10 import android.view.MenuItem;
11
12 public class MainActivity extends AppCompatActivity {
13
14     @Override
15     protected void onCreate(Bundle savedInstanceState) {
16         super.onCreate(savedInstanceState);
17         setContentView(R.layout.activity_main);
18         Toolbar toolbar = findViewById(R.id.toolbar);
19         setSupportActionBar(toolbar);
20
21         FloatingActionButton fab = findViewById(R.id.fab);
22         fab.setOnClickListener(new View.OnClickListener() {
23             @Override
24             public void onClick(View view) {
25                 Snackbar.make(view, text: "Replace with your own action", Snackbar.LENGTH_LONG)
26                     .setAction(text: "Action", listener: null).show();
27             }
28         });
29     }
30
31     @Override
32     public boolean onCreateOptionsMenu(Menu menu) {
33         // Inflate the menu; this adds items to the action bar if it is present.
34         getMenuInflater().inflate(R.menu.menu_main, menu);
35         return true;
36     }
37
38     @Override
39     public boolean onOptionsItemSelected(MenuItem item) {
```

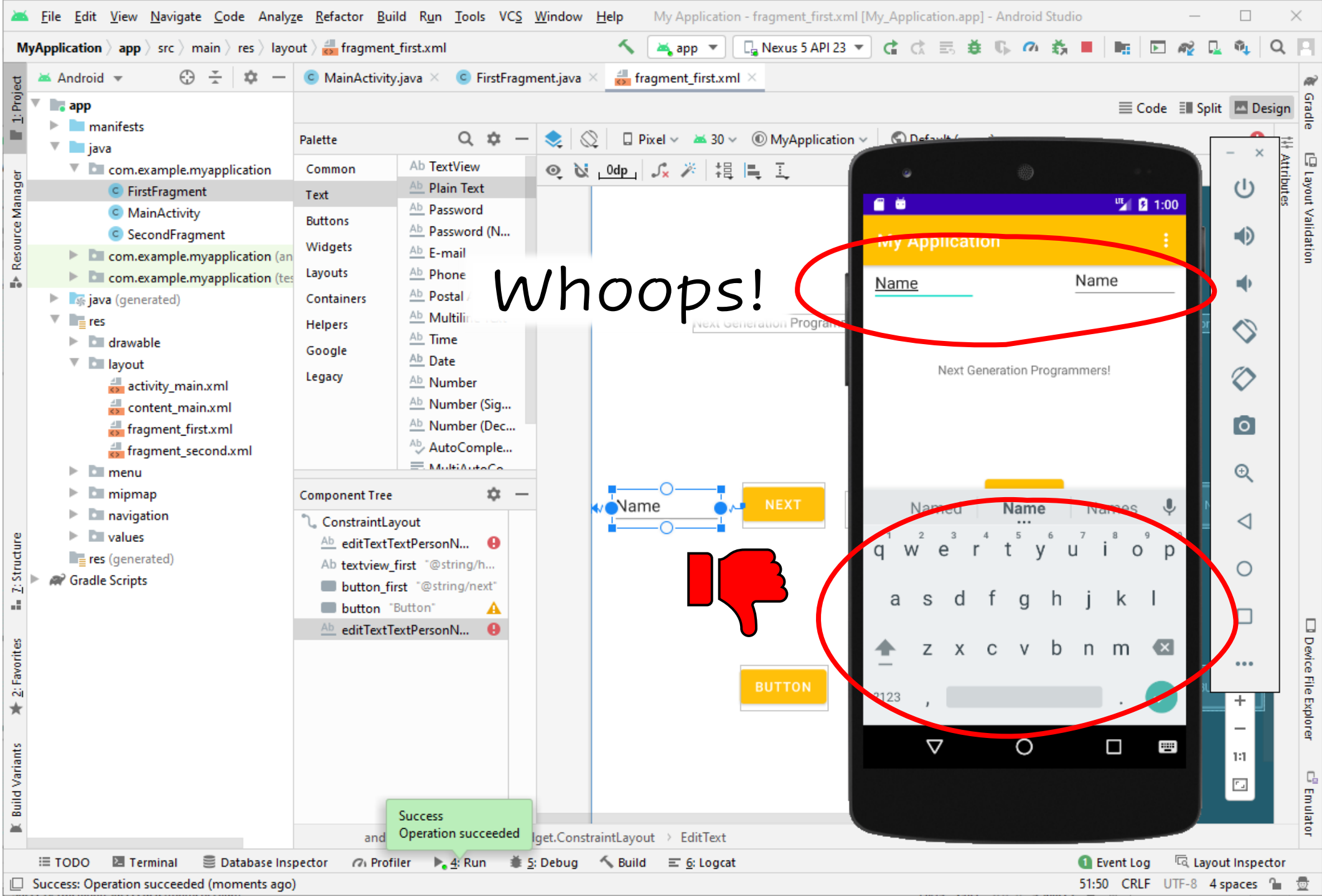
# Where we are at after Lesson 1...



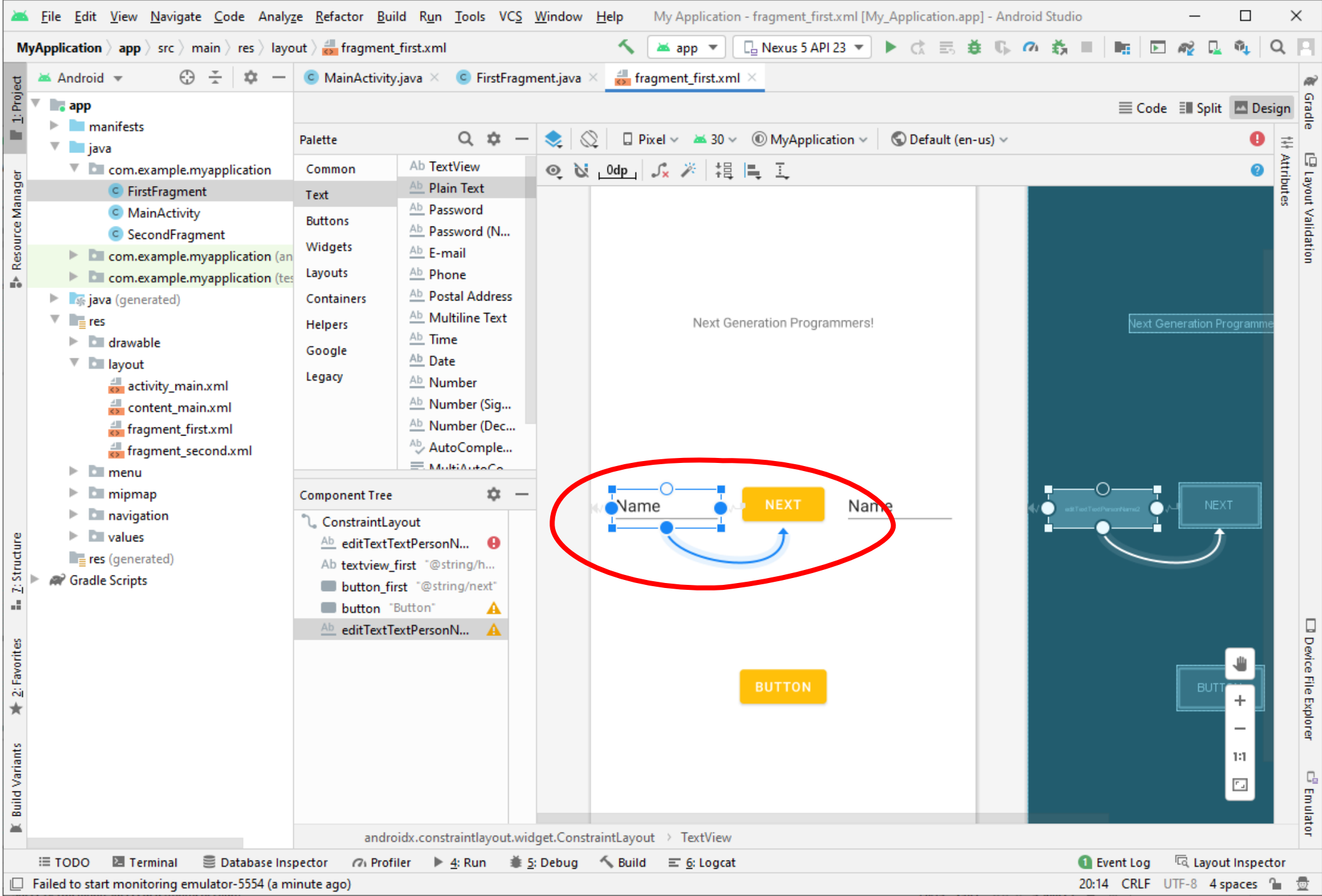


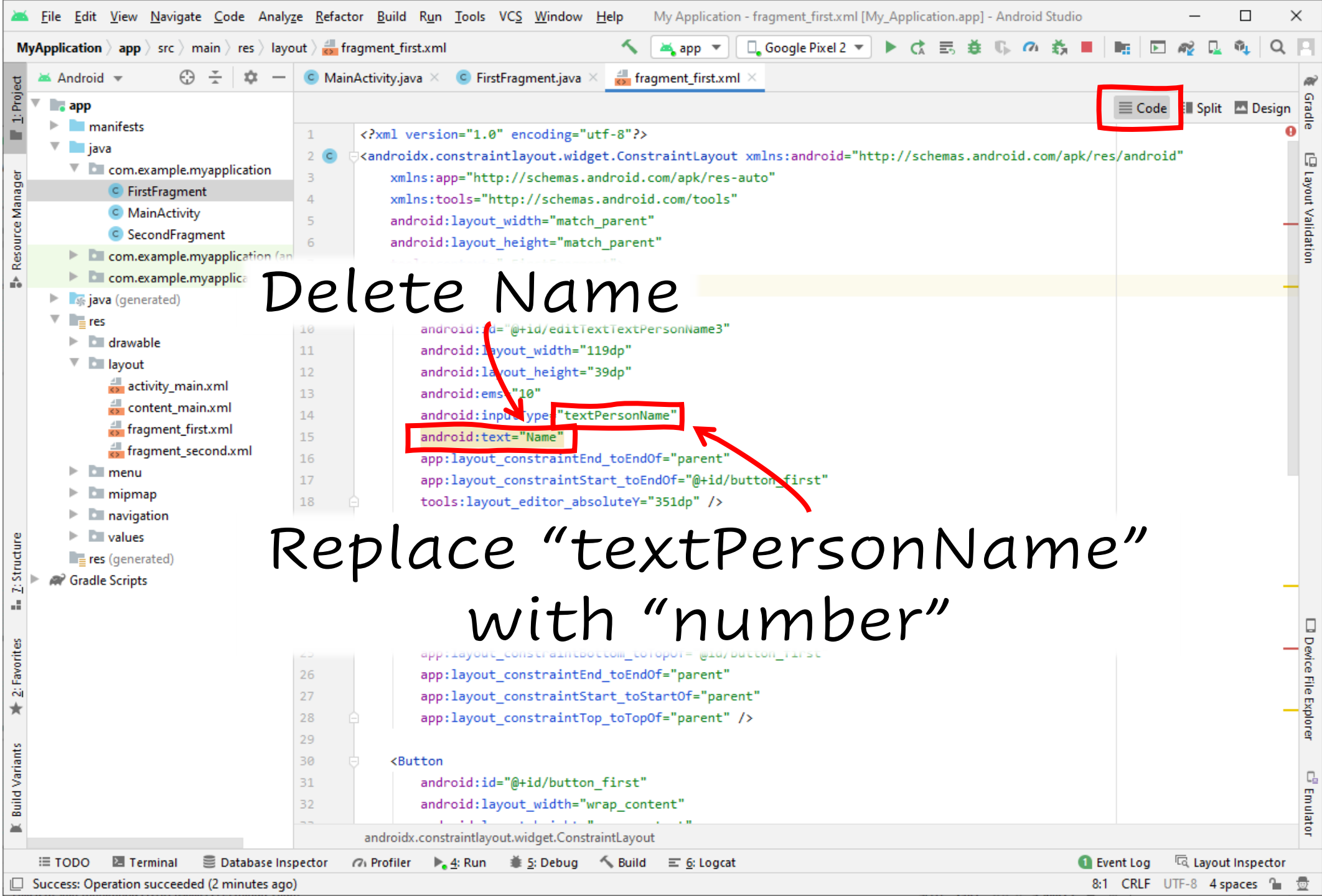
Task 1: Let's add some more  
elements











File Edit View Navigate Code Analyze Refactor Build Run Tools VCS Window Help My Application - fragment\_first.xml [My\_Application.app] - Android Studio

MyApplication > app > src > main > res > layout > fragment\_first.xml

Android > MainActivity.java > FirstFragment.java > fragment\_first.xml

Code Split Design

1: Project

- app
  - manifests
  - java
    - com.example.myapplication
      - FirstFragment
      - MainActivity
      - SecondFragment
    - com.example.myapplication (an
    - com.example.myapplication (tes
  - java (generated)
  - res
    - drawable
    - layout
      - activity\_main.xml
      - content\_main.xml
      - fragment\_first.xml
      - fragment\_second.xml
    - menu
    - mipmap
    - navigation
    - values
    - res (generated)
  - Gradle Scripts

2: Structure

3: Favorites

Build Variants

```
32 <include layout="@layout/content_main" />
33
34 android:layout_width="wrap_content"
35 android:layout_height="wrap_content"
36 android:text="Next"
37 app:layout_constraintBottom_toBottomOf="parent"
38 app:layout_constraintEnd_toEndOf="parent"
39 app:layout_constraintStart_toStartOf="parent"
40 app:layout_constraintTop_toTopOf="parent" />
41
42 <Button
43     android:id="@+id/button"
44     android:layout_width="wrap_content"
45     android:layout_height="wrap_content"
46     android:text="Button"
47     app:layout_constraintBottom_toBottomOf="parent"
48     app:layout_constraintEnd_toEndOf="parent"
49     app:layout_constraintStart_toStartOf="parent"
50     app:layout_constraintTop_toBottomOf="@+id/button_first" />
51
52 <EditText
53     android:id="@+id/editTextTextPersonName2"
54     android:layout_width="117dp"
55     android:layout_height="42dp"
56     android:ems="10"
57     android:inputType="number"
58     android:text=""
59     app:layout_constraintBottom_toBottomOf="@+id/button_first"
60     app:layout_constraintEnd_toStartOf="@+id/button_first"
61     app:layout_constraintStart_toStartOf="parent" />
62 </androidx.constraintlayout.widget.ConstraintLayout>
```

Next Generation Programmers!

NEXT

1 2 3 -

4 5 6 ,

7 8 9 ✕

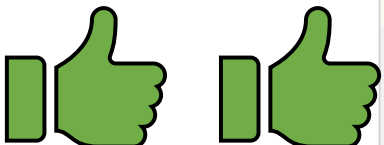
. 0 \_ ✓

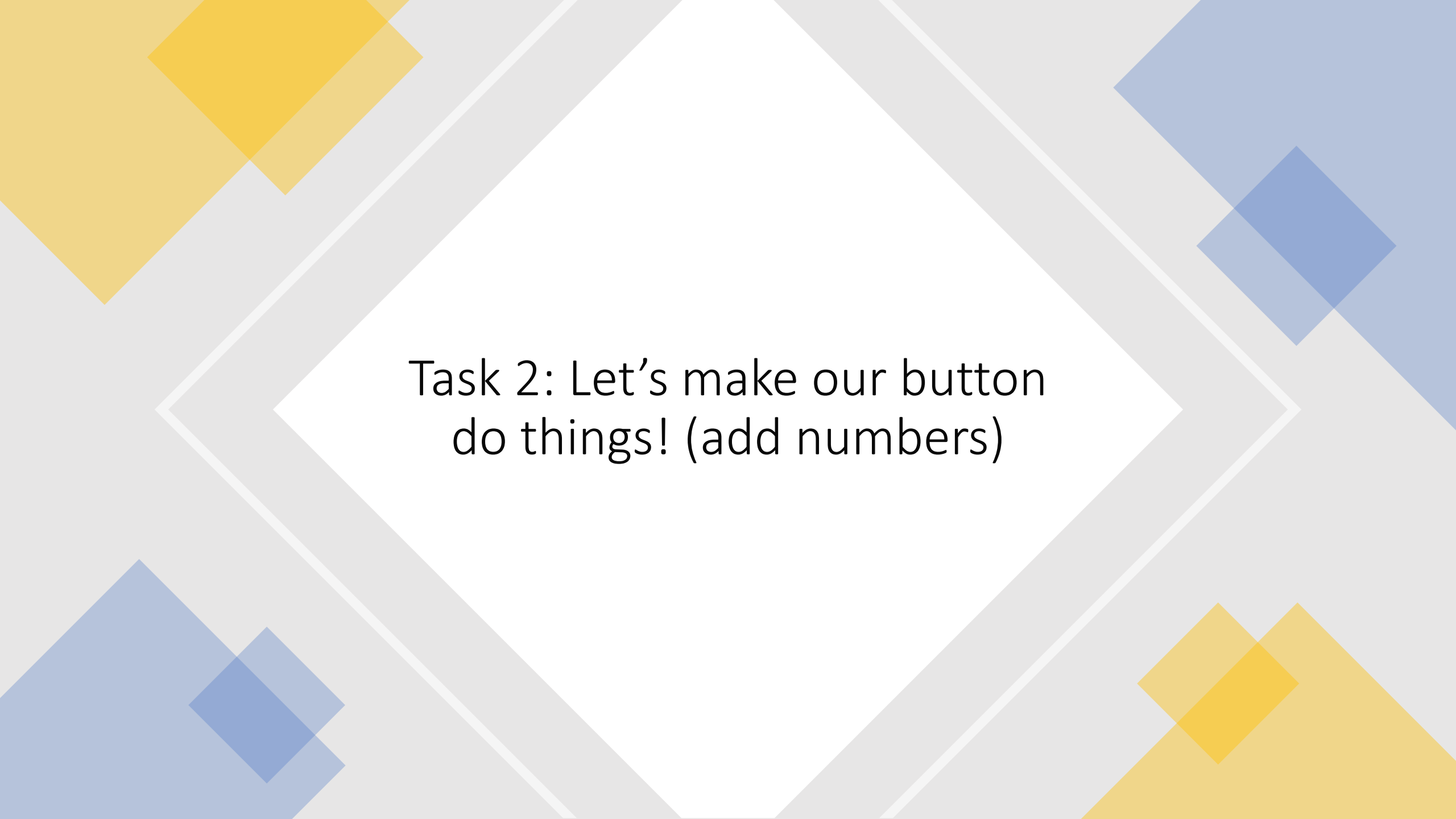
androidx.constraintlayout.widget.ConstraintLayout > EditText

Event Log Layout Inspector

55:35 CRLF UTF-8 4 spaces

Success: Operation succeeded (3 minutes ago)





Task 2: Let's make our button  
do things! (add numbers)

Button!  
Function

The screenshot shows the Android Studio IDE with the following components:

- Top Bar:** Menus (File, Edit, View, Navigate, Code, Analyze, Refactor, Build, Run, Tools, VCS, Window, Help) and the current file path: My Application - FirstFragment.java [My\_Application.app].
- Toolbar:** Icons for running, debugging, and other development actions.
- Left Panel:** Project structure tree showing the package hierarchy: `com.example.myapplication` containing `FirstFragment`, `MainActivity`, and `SecondFragment`. A red arrow points to `FirstFragment`.
- Main Editor:** The Java code for `FirstFragment.java`. The code is as follows:

```
1 package com.example.myapplication;
2
3 import ...
4
5 public class FirstFragment extends Fragment {
6
7     private FragmentFirstBinding binding;
8
9     @Override
10    public View onCreateView(
11        LayoutInflater inflater, ViewGroup container,
12        Bundle savedInstanceState
13    ) {
14
15        binding = FragmentFirstBinding.inflate(inflater, container, attachToParent: false);
16        return binding.getRoot();
17    }
18
19    public void onViewCreated(@NonNull View view, Bundle savedInstanceState) {
20        super.onViewCreated(view, savedInstanceState);
21
22        binding.buttonFirst.setOnClickListener(new View.OnClickListener() {
23            @Override
24            public void onClick(View view) {
25                NavHostFragment.findNavController( fragment: FirstFragment.this)
26                    .navigate(R.id.action_FirstFragment_to_SecondFragment);
27            }
28        });
29    }
30 }
```

Red annotations highlight the button click listener setup and the navigation logic:

  - A red box around `binding.buttonFirst.setOnClickListener(new View.OnClickListener() {` with a red arrow pointing to it from the text "Button!".
  - A red box around the `onClick` method implementation with a red arrow pointing to it from the text "Function".
- Right Panel:** Gradle, Device File Explorer, and Emulator tabs.
- Bottom Bar:** Status bar showing build status (Gradle build failed in 4 s 50 ms (8 minutes ago)), time (27:6), and encoding (CRLF, UTF-8, 4 spaces).

File Edit View Navigate Code Analyze Refactor Build Run Tools VCS Window Help My Application - FirstFragment.java [My\_Application.app]

main > java > com > example > myapplication > FirstFragment > onCreateView

Android FirstFragment.java

Project

- app
  - manifests
  - java
    - com.example.myapplication
      - FirstFragment
      - MainActivity
      - SecondFragment
    - com.example.myapplication (android)
    - com.example.myapplication (test)
  - java (generated)
  - res
    - res (generated)
  - Gradle Scripts

Resource Manager

Structure

Build Variants

Device File Explorer

Emulator

```
22     } {
23
24         binding = FragmentFirstBinding.inflate(inflater, container, attachToParent: false);
25         return binding.getRoot();
26     }
27
28
29     public void onCreateView(@NonNull View view, Bundle savedInstanceState) {
30         super.onCreateView(view, savedInstanceState);
31
32         binding.buttonFirst.setOnClickListener(new View.OnClickListener() {
33             @Override
34             public void onClick(View view) {
35                 NavHostFragment.findNavController( fragment: FirstFragment.this)
36                     .navigate(R.id.action_FirstFragment_to_SecondFragment);
37             }
38         });
39
40         binding.buttonFirst.setOnClickListener(new View.OnClickListener() {
41             @Override
42             public void onClick(View view) {
43                 NavHostFragment.findNavController( fragment: FirstFragment.this)
44                     .navigate(R.id.action_FirstFragment_to_SecondFragment);
45             }
46         });
47     }
48
49     @Override
50     public void onDestroyView() {
51         super.onDestroyView();
52         binding = null;
```

Copy

Gradle build failed in 4 s 50 ms (9 minutes ago)

Event Log Layout Inspector

38:12 CRLF UTF-8 4 spaces



File Edit View Navigate Code Analyze Refactor Build Run Tools VCS Window Help My Application - FirstFragment.java [My\_Application.app]

main > java > com > example > myapplication > FirstFragment > onCreateView app Nexus 5 API 23

Android FirstFragment.java

Project

- app
  - manifests
  - java
    - com.example.myapplication
      - FirstFragment
      - MainActivity
      - SecondFragment
    - com.example.myapplication (android)
    - com.example.myapplication (test)
    - java (generated)
    - res
      - res (generated)
    - Gradle Scripts

Resource Manager

Structure

Build Variants

Device File Explorer

Emulator

```
22     } {
23
24         binding = FragmentFirstBinding.inflate(inflater, container, attachToParent: false);
25         return binding.getRoot();
26     }
27
28
29     public void onCreateView(@NonNull View view, Bundle savedInstanceState) {
30         super.onCreateView(view, savedInstanceState);
31
32         binding.buttonFirst.setOnClickListener(new View.OnClickListener() {
33             @Override
34             public void onClick(View view) {
35                 NavHostFragment.findNavController( fragment: FirstFragment.this)
36                     .navigate(R.id.action_FirstFragment_to_SecondFragment);
37             }
38         });
39
40         binding.buttonFirst.setOnClickListener(new View.OnClickListener() {
41             @Override
42             public void onClick(View view) {
43                 NavHostFragment.findNavController( fragment: FirstFragment.this)
44                     .navigate(R.id.action_FirstFragment_to_SecondFragment);
45             }
46         });
47     }
48
49     @Override
50     public void onDestroyView() {
51         super.onDestroyView();
52         binding = null;
```

Gradle build failed in 4 s 50 ms (9 minutes ago)

38:12 CRLF UTF-8 4 spaces

MyApplication - fragment\_first.xml [My\_Application.app]

MyApplication > app > src > main > res > layout > fragment\_first.xml

1: Project

- app
  - manifests
  - java
    - com.example.myapplication
      - FirstFragment
      - MainActivity
      - SecondFragment
    - com.example.myapplication
    - com.example.myapplication
  - java (generated)
  - res
    - drawable
    - layout
      - activity\_main.xml
      - content\_main.xml
      - fragment\_first.xml
      - fragment\_second.xml
    - menu
    - mipmap
    - navigation
    - values
  - res (generated)
  - Gradle Scripts

2: Structure

3: Favorites

Build Variants

```
13 <android.support.design.widget.TextInputEditText
14     android:text="Next Generation Programmers!"
15     app:layout_constraintBottom_toTopOf="@id/button_first"
16     app:layout_constraintEnd_toEndOf="parent"
17     app:layout_constraintStart_toStartOf="parent"
18     app:layout_constraintTop_toTopOf="parent" />
19
20 <Button
21     android:id="@+id/button_first"
22     android:layout_width="wrap_content"
23     android:layout_height="wrap_content"
24     android:text="Next"
25     app:layout_constraintBottom_toBottomOf="parent"
26     app:layout_constraintEnd_toEndOf="parent"
27     app:layout_constraintStart_toStartOf="parent"
28     app:layout_constraintTop_toBottomOf="@id/text_input" />
29
30 <Button
31     android:id="@+id/button"
32     android:layout_width="wrap_content"
33     android:layout_height="wrap_content"
34     android:text="Button"
35     app:layout_constraintBottom_toBottomOf="parent"
36     app:layout_constraintEnd_toEndOf="parent"
37     app:layout_constraintStart_toStartOf="parent"
38     app:layout_constraintTop_toBottomOf="@id/button_first" />
39
40 <EditText
41     android:id="@+id/editTextTextPersonName"
42     android:layout_width="111dp"
```

Code Split Design

Palette

0dp

Next Generation Programmers!

NEXT

BUTTON

Component Tree

Layout Validation

Attributes

Device File Explorer

Emulator

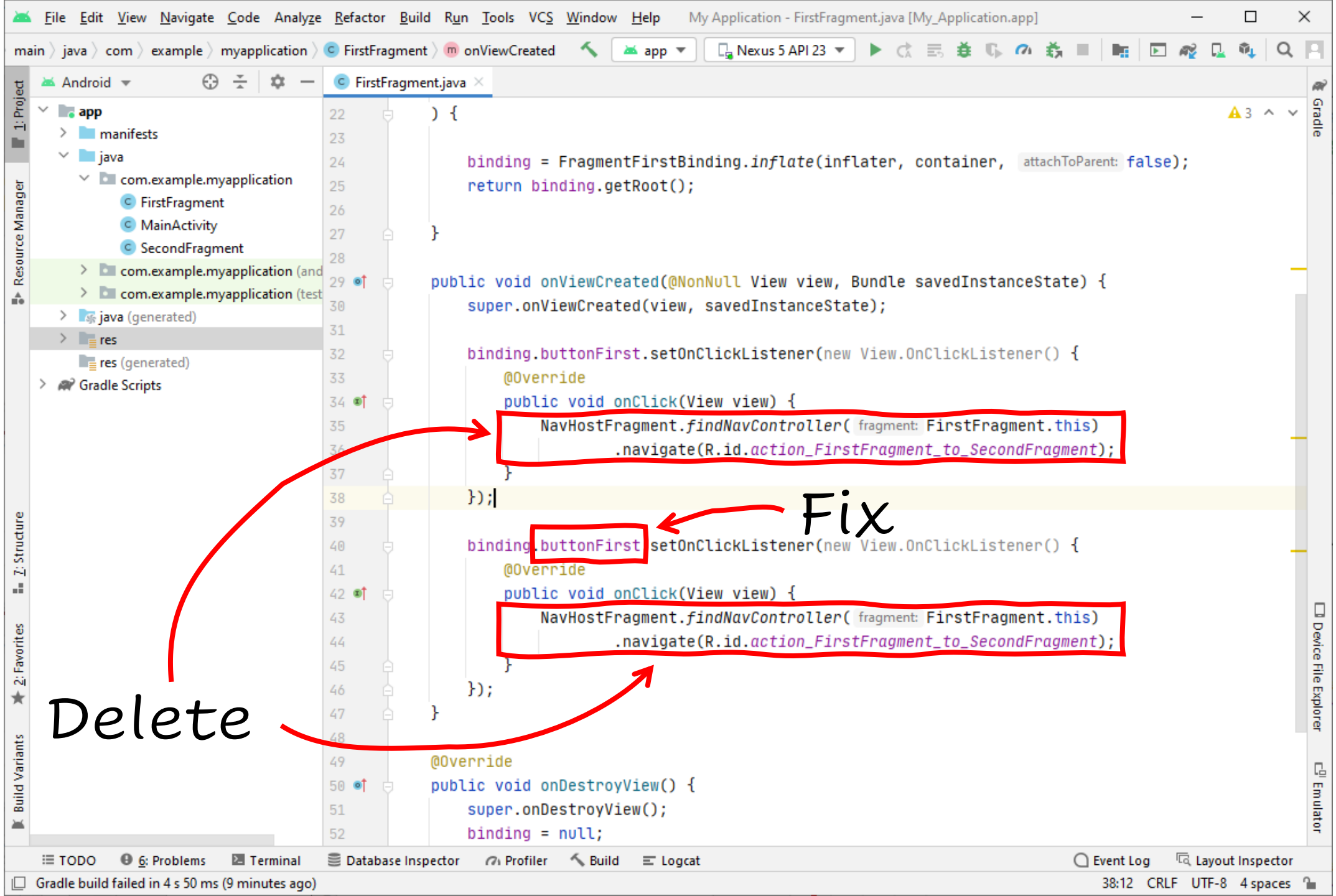
TODO Problems Terminal Database Inspector Profiler Build Logcat

Event Log Layout Inspector

Failed to start monitoring emulator-5554 (12 minutes ago)

29:5 CRLF UTF-8 4 spaces





File Edit View Navigate Code Analyze Refactor Build Run Tools VCS Window Help My Application - FirstFragment.java [My\_Application.app]

myapplication > FirstFragment > onCreateView > anonymous OnClickListener > onClick

app Nexus 5 API 23

1: Project

- app
  - manifests
  - java
    - com.example.myapplication
      - FirstFragment
      - MainActivity
      - SecondFragment
    - com.example.myapplication
    - com.example.myapplication
  - java (generated)
  - res
    - drawable
    - layout
      - activity\_main.xml
      - content\_main.xml
      - fragment\_first.xml
      - fragment\_second.xml
    - menu
    - mipmap
    - navigation
    - values
  - res (generated)
- Gradle Scripts

Resource Manager

2: Structure

3: Favorites

Build Variants

Device File Explorer

Emulator

```
17
18 @Override
19 public View onCreateView(
20     LayoutInflater inflater, ViewGroup container,
21     Bundle savedInstanceState
22 ) {
23
24     binding = FragmentFirstBinding.inflate(inflater, container, attachToParent: false);
25     return binding.getRoot();
26
27 }
28
29 public void onViewCreated(@NonNull View view, Bundle savedInstanceState) {
30     super.onViewCreated(view, savedInstanceState);
31
32     binding.buttonFirst.setOnClickListener(new View.OnClickListener() {
33         @Override
34         public void onClick(View view) {
35             |
36         }
37     });
38
39     binding.button.setOnClickListener(new View.OnClickListener() {
40         @Override
41         public void onClick(View view) {
42             |
43         }
44     });
45
46
47 @Override
48 public void onDestroyView() {
```


4

Failed to start monitoring emulator-5554 (17 minutes ago)

35:17 CRLF UTF-8 4 spaces

Event Log Layout Inspector

Logcat Build Profiler Database Inspector Terminal Problems 6: TODO



File Edit View Navigate Code Analyze Refactor Build Run Tools VCS Window Help My Application - FirstFragment.java [My\_Application.app]

myapplication > FirstFragment > onCreateView > anonymous OnClickListener > onClick

Android FirstFragment.java fragment\_first.xml

1: Project

- app
  - manifests
  - java
    - com.example.myapplication
      - FirstFragment
      - MainActivity
      - SecondFragment
    - com.example.myapplication
    - com.example.myapplication

2: Structure

- mipmap
- navigation
- values
- res (generated)
- Gradle Scripts

3: Favorites

4: Build Variants

5: Device File Explorer

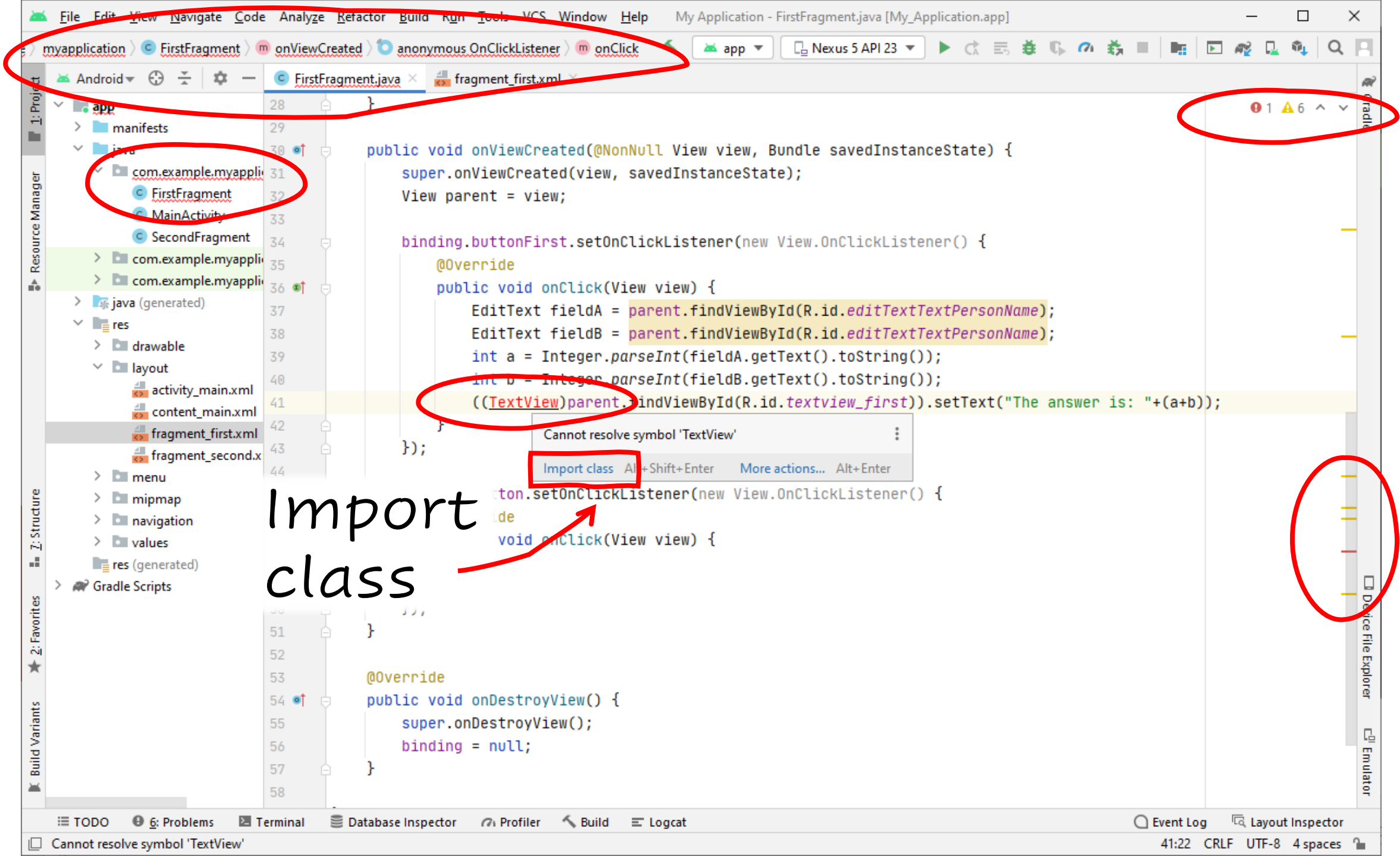
6: Emulator

```
25
26     binding = FragmentFirstBinding.inflate(inflater, container, attachToParent: false);
27     return binding.getRoot();
28
29 }
30
31 public void onCreateView(@NonNull View view, Bundle savedInstanceState) {
32     super.onCreateView(view, savedInstanceState);
33     View parent = view;
34
35     binding.buttonFirst.setOnClickListener(new View.OnClickListener() {
36         @Override
37         public void onClick(View view) {
38             EditText fieldA = parent.findViewById(R.id.editTextTextPersonName);
39             EditText fieldB = parent.findViewById(R.id.editTextTextPersonName2);
40             int a = Integer.parseInt(fieldA.getText().toString());
41             int b = Integer.parseInt(fieldB.getText().toString());
42             ((TextView)parent.findViewById(R.id.textview_first)).setText("The answer is: " + (a+b));
43         }
44     });
45
46     binding.button.setOnClickListener(new View.OnClickListener() {
47         @Override
48         public void onClick(View view) {
49
50         }
51     });
52 }
53
54 @Override
55 public void onDestroyView() {
```

Type this code

Launch succeeded (2 minutes ago)

38:84 CRLF UTF-8 4 spaces



MyApplication > app > src > main > java > com > example > myapplication > FirstFragment

Android > FirstFragment.java x fragment\_first.xml x

1: Project

Resource Manager

2: Structure

Build Variants

2: Favorites

Device File Explorer

Emulator

```
1 package com.example.myapplication;
2
3 import android.os.Bundle;
4 import android.view.LayoutInflater;
5 import android.view.View;
6 import android.view.ViewGroup;
7 import android.widget.EditText;
8 import android.widget.TextView;
9
10 import androidx.annotation.NonNull;
11 import androidx.fragment.app.Fragment;
12 import androidx.navigation.fragment.NavHostFragment;
13
14 import com.example.myapplication.databinding.FragmentFirstBinding;
15
16 public class FirstFragment extends Fragment {
17
18     private FragmentFirstBinding binding;
19
20     @Override
21     public View onCreateView(
22         LayoutInflater inflater, ViewGroup container,
23         Bundle savedInstanceState
24     ) {
25
26         binding = FragmentFirstBinding.inflate(inflater, container, attachToParent: false);
27         return binding.getRoot();
28     }
29
30
31     public void onViewCreated(@NonNull View view, Bundle savedInstanceState) {
```

8

Failed to start monitoring emulator-5554 (31 minutes ago)

1:35 CRLF UTF-8 4 spaces



File Edit View Navigate Code Analyze Refactor Build Run Tools VCS Window Help My Application - FirstFragment.java [My\_Application.app]

myapplication > FirstFragment > onCreateView > anonymous OnClickListener > onClick

Android > FirstFragment.java > fragment\_first.xml

1: Project

- app
  - manifests
  - java
    - com.example.myapplication
      - FirstFragment
      - MainActivity
      - SecondFragment
    - com.example.myapplication
    - com.example.myapplication
  - java (generated)
  - res
    - drawable
    - layout
      - activity\_main.xml
      - content\_main.xml
      - fragment\_first.xml
      - fragment\_second.xml
    - menu
    - mipmap
    - navigation
    - values
  - res (generated)
- Gradle Scripts

2: Structure

3: Favorites

4: Build Variants

5: Run

```
25
26     binding = FragmentFirstBinding.inflate(inflater, container, false);
27     return binding.getRoot();
28
29 }
30
31 public void onCreateView(@NonNull View view, Bundle savedInstanceState) {
32     super.onCreateView(view, savedInstanceState);
33     View parent = view;
34
35     binding.buttonFirst.setOnClickListener(new View.OnClickListener() {
36         @Override
37         public void onClick(View view) {
38             EditText fieldA = parent.findViewById(R.id.editTextTextPersonName);
39             EditText fieldB = parent.findViewById(R.id.editTextTextPersonName);
40             int a = Integer.parseInt(fieldA.getText().toString());
41             int b = Integer.parseInt(fieldB.getText().toString());
42             ((TextView)parent.findViewById(R.id.textViewFirst)).setText(String.valueOf(a + b));
43         }
44     });
45
46     binding.button.setOnClickListener(new View.OnClickListener() {
47         @Override
48         public void onClick(View view) {
49
50         }
51     });
52
53 }
54
55 @Override
56 public void onDestroy() {
57     super.onDestroy();
58 }
```

Launch succeeded

First Fragment

The answer is: 2021

2000 NEXT 21

BUTTON

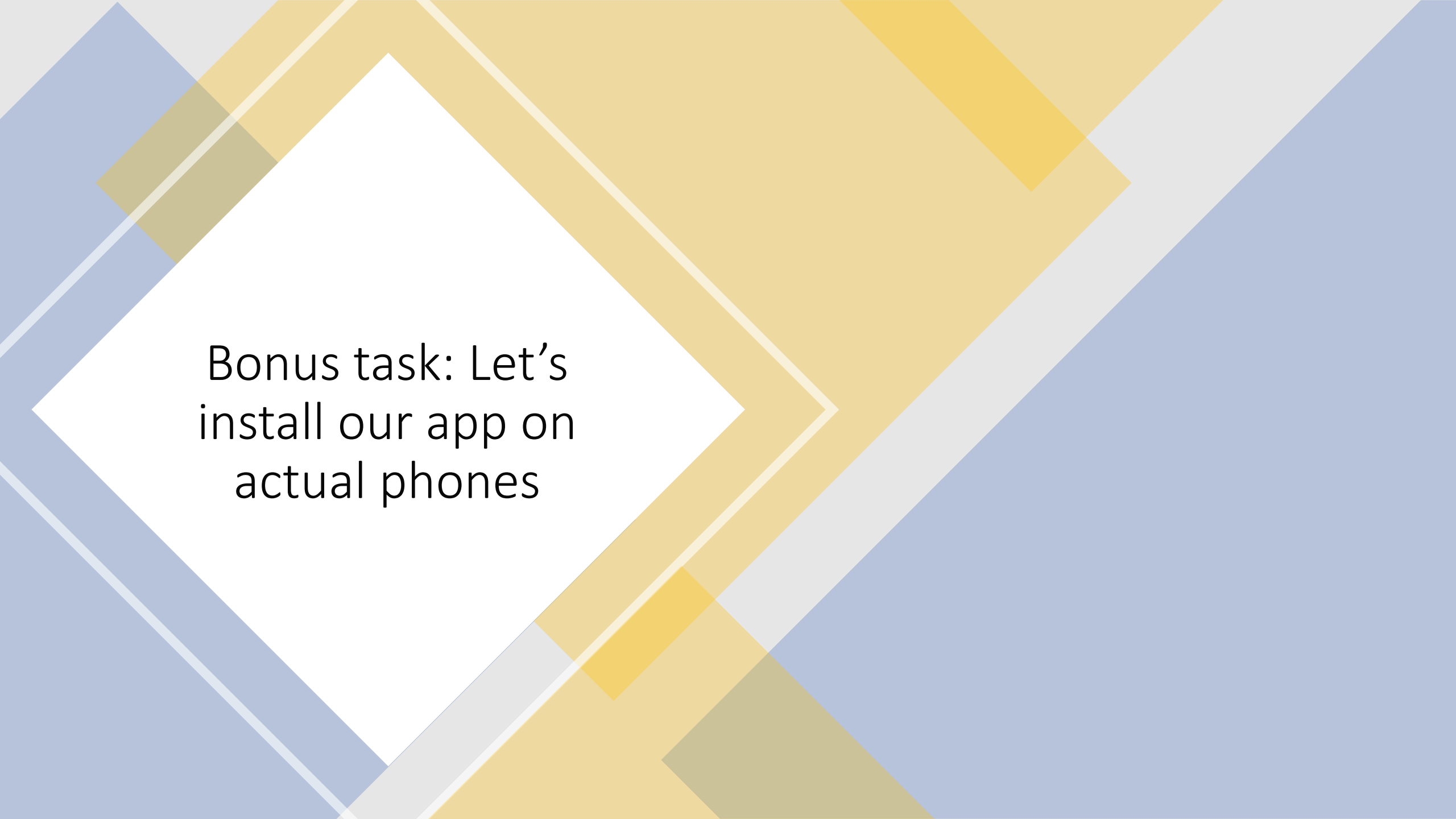
Device File Explorer

Emulator

TODO Problems Terminal Database Inspector Profiler 4: Run Build Logcat

Event Log Layout Inspector

Launch succeeded (a minute ago) 38:84 CRLF UTF-8 4 spaces



Bonus task: Let's  
install our app on  
actual phones

