Lab 2 - Basic GUI Components

Due Sep 27 by 3:45pm **Points** 10 **Submitting** a file upload
Available Sep 20 at 12am - Sep 27 at 3:45pm 8 days

This assignment was locked Sep 27 at 3:45pm.

Lab 2: Basic GUI Components

Introduction:

This lab will show you how to work with the basic GUI components and help you learn how to build a simple user interface in Android. You will learn how to work with buttons, text-fields, toasts and images. You will also create your own basic calculator application.

All of your work should be pushed to some git repository. For Milestone 1, you will clone from the provided template in the classroom repository, make all changes and you will have to commit and push them to the cloned repository in GitHub classroom. For Milestone 2, you will be creating a new project, and we expect you to commit and push this new project into your own GitHub account (not to classroom).

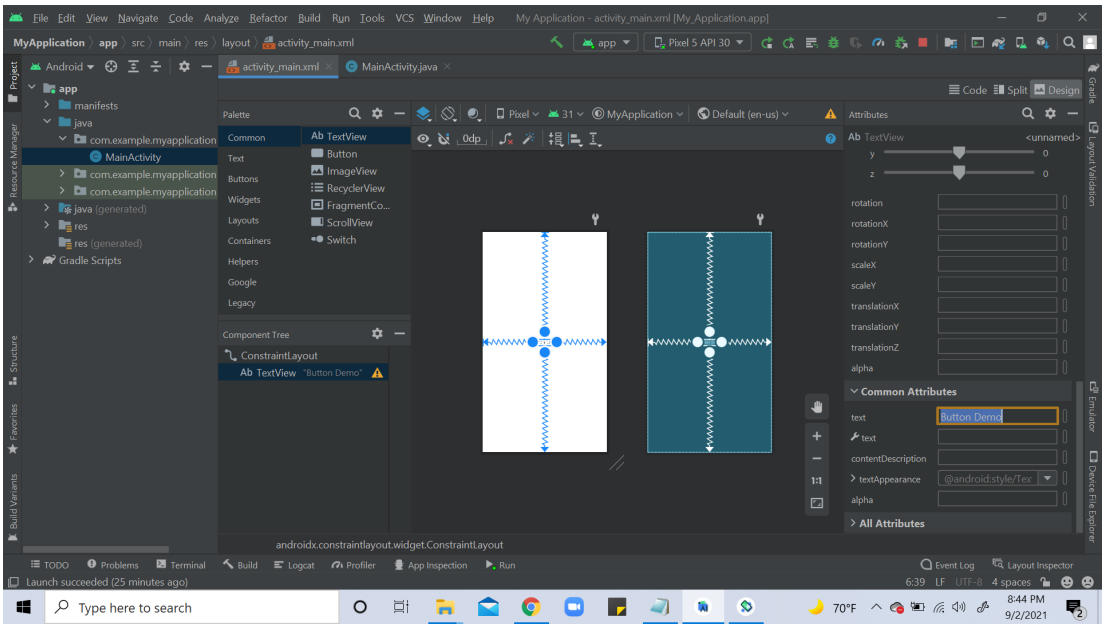
Also in many of the tasks below, we describe what you need to do in text briefly, and follow it with a picture in which updated code is shown. In specific cases, you will need to type that code into your project to accomplish the task.

Directions:

Milestone 1 - Setup your first button and display a toast. In this milestone, we will learn how to add TextViews, TextFields, Buttons and Toasts to your app. We will also learn how to switch activities using intents. We are going to take input using an EditText component, and display our output in (i) toasts and (ii) different activity using intents.

1. As you did in lab 1, clone the Lab2 repository by selecting File > New > Project from Version Control > Git
2. Then click the following link and accept the invitation: **https://classroom.github.com/a/MKfGE-Pz (https://classroom.github.com/a/MKfGE-Pz)**
3. You'll get a link in the form **https://github.com/CS-407-Fall-2021/lab2- (https://github.com/CS407-Fall-2021/lab2-)** yourgithubnamehere
4. Copy this link in the URL text field in 'Clone' in Android Studio and click 'Clone'.
5. Change the default "Hello World" TextView with a meaningful header for your app e.g. "Button Demo". You can do this in 2 ways:

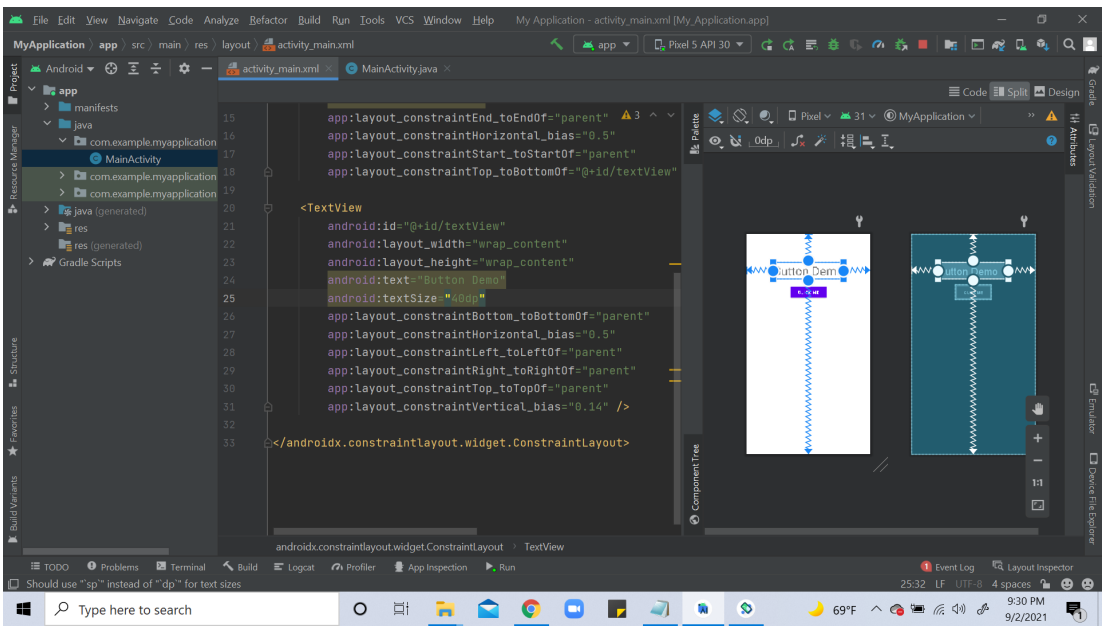
a. Go to the "Design" tab in activity_main.xml. In the preview screen that is being displayed, click on the TextView. Its attributes should appear on the right hand side. Change the text attribute to "Button Demo". This is one way to change attributes of components.



Setting up TextView with "Design" tab

OR

b. Go to the “Code” tab in activity_main.xml. In the TextView component change the text attribute to display “Button Demo”. You can also change the position of the TextView by either dragging it across the screen or changing its attributes. Remember that we are using Constraint Layout. Thus we need to add the required constraints to our component. Here is an example.

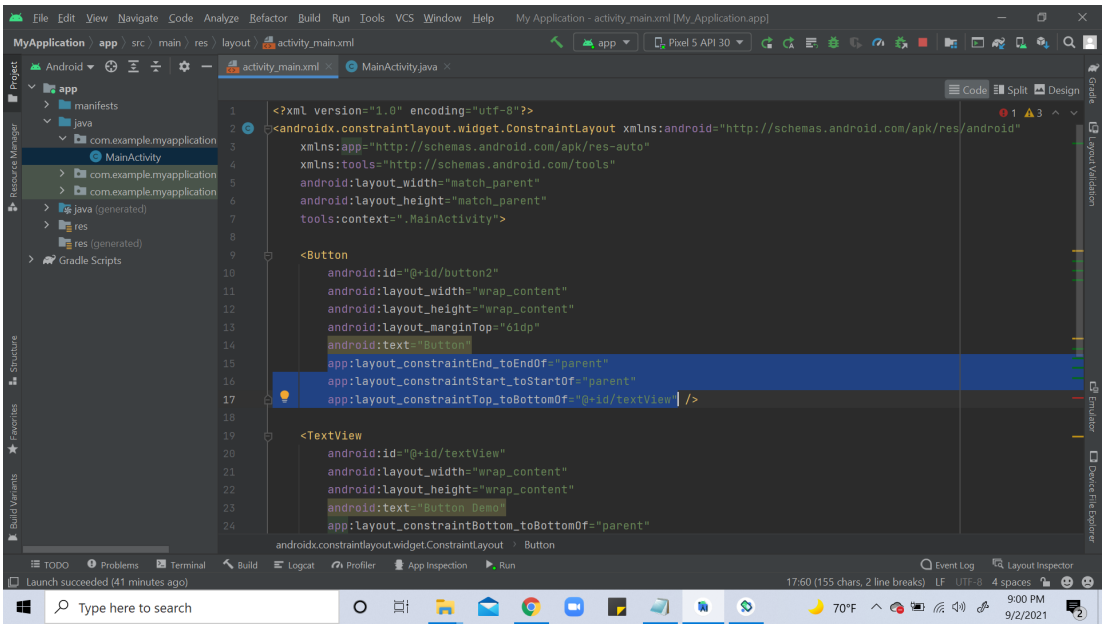


Setting up TextView with "Code" tab

Attributes you can use:

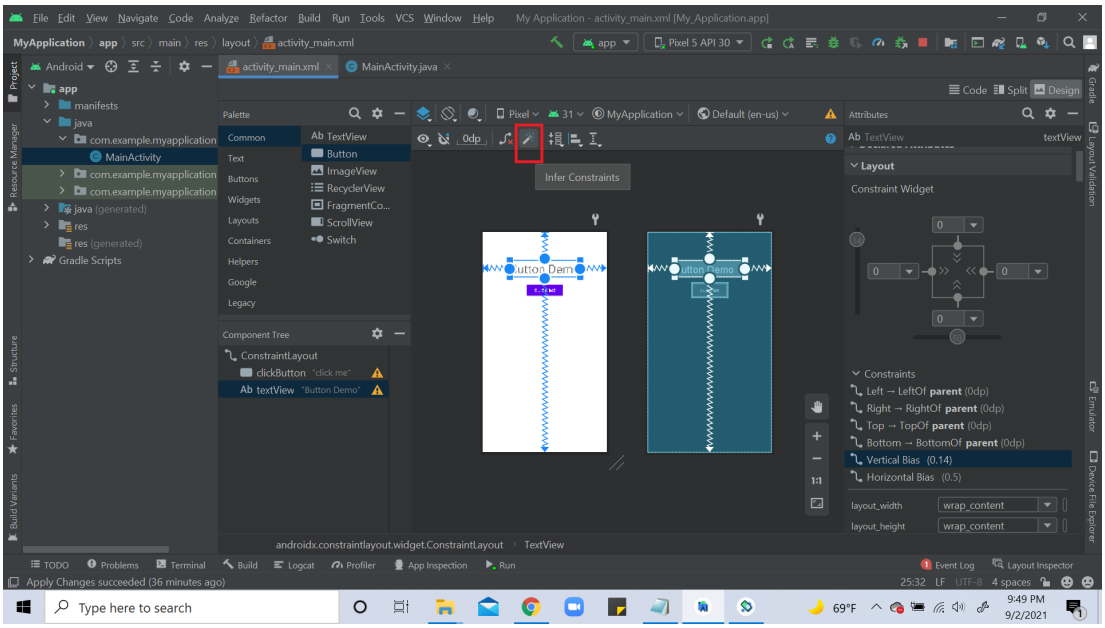
- layout_constraintTop_toTopOf — Align the top of the desired view to the top of another.
- layout_constraintTop_toBottomOf — Align the top of the desired view to the bottom of another.
- layout_constraintBottom_toTopOf — Align the bottom of the desired view to the top of another.
- layout_constraintBottom_toBottomOf — Align the bottom of the desired view to the bottom of another.
- layout_constraintLeft_toTopOf — Align the left of the desired view to the top of another.

- layout_constraintLeft_toBottomOf — Align the left of the desired view to the bottom of another.
- layout_constraintLeft_toLeftOf — Align the left of the desired view to the left of another.
- layout_constraintLeft_toRightOf — Align the left of the desired view to the right of another.
- layout_constraintRight_toTopOf — Align the right of the desired view to the top of another.
- layout_constraintRight_toBottomOf — Align the right of the desired view to the bottom of another.
- layout_constraintRight_toLeftOf — Align the right of the desired view to the left of another.
- layout_constraintRight_toRightOf — Align the right of the desired view to the right of another.
- layout_constraintHorizontal_bias: This allows us to position a view along the horizontal axis, using a bias value, this will be relative to its constrained position
- layout_constraintVertical_bias: This allows us to position a view along the vertical axis, using a bias value, this will be relative to its constrained position



Creating constraints with "Code" tab

In addition to adding constraints to every view as you place them in the layout, you can also move each view into the positions you desire, and then click Infer Constraints (the magic wand in the picture below) to automatically create constraints. Infer Constraints **scans the layout to determine the most effective set of constraints for all views**.



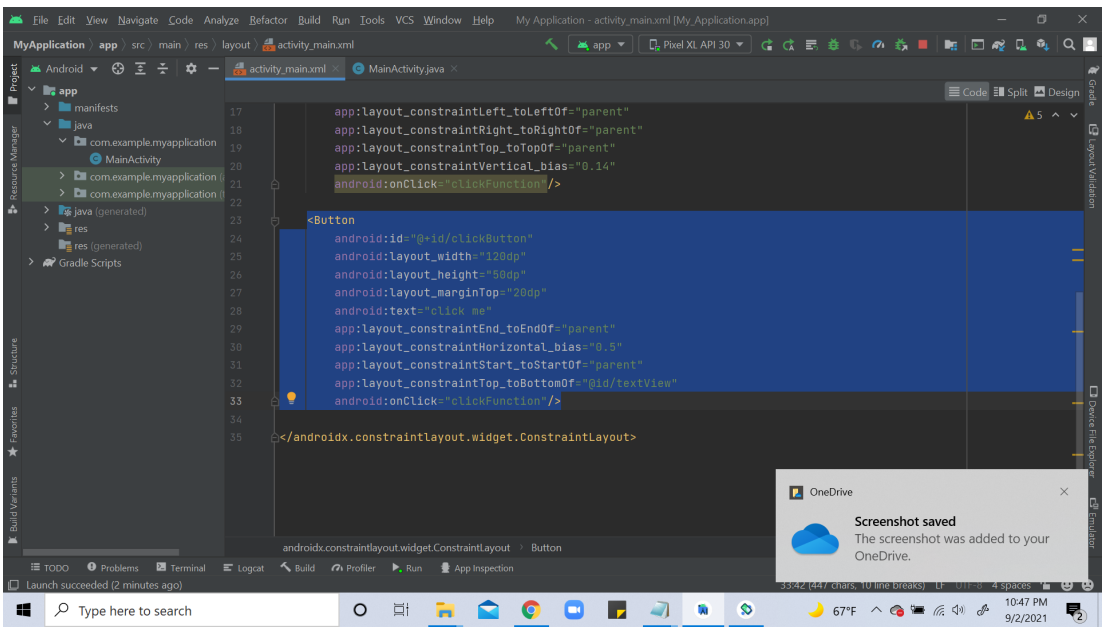
Infer constraints with "Design" tab

6. Create a new button. You can do this in one of the following two ways:

a. In the “Design” tab in activity_main.xml, drag a button component to the center of the screen. Select this component to view it’s attributes on the right side of the screen. You can edit these attributes as you like. Use the attributes mentioned in the previous step to position your button in the center horizontally.

OR

b. In the “Code” tab in activity_main.xml, create a new button component and give it the properties as in the following snapshot. Here are the functionalities of some of these attributes. You can use the attributes mentioned in the previous step. Make sure your button is centered horizontally.



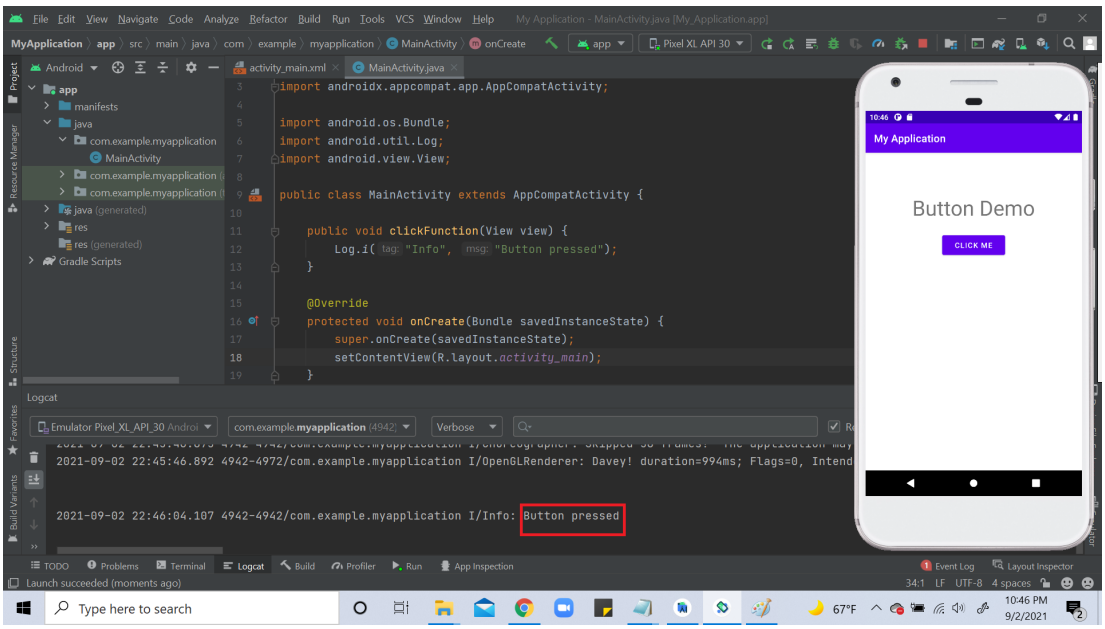
Creating new button

Note: You can assign attributes as you like, but make sure that each component has an id and that your app looks presentable. For buttons, make sure that each button has an onClick property. To

define the click event handler for a button, add the **android:onClick** (https://developer.android.com/reference/android/R.attr.html#onClick) attribute to the <Button> element in your XML layout. The value for this attribute must be the name of the method you want to call in response to a click event. You can refer to the code in the picture above.

Note: When you add certain attributes or properties, Android studio might prompt you to import some packages. Make sure you import them so that you don't run into any errors. One way is to click Alt+Enter on the attribute to import the relevant package. For example: import android.view.View in MainActivity.java

7. Switch to MainActivity.java and write the code for the function you specified in the onClick property for your button in activity_main.xml. This code will tell the app what to do when the button is pressed. For now, we will display a message in Logcat when the button is pressed. Here is an example



Display "Button pressed" in LogCat

8. Run the app and check if the button is working properly. You can switch to the Logcat tab by selecting "Logcat" at the bottom of the screen. You'll be able to see your output in the Logcat when the button is pressed.

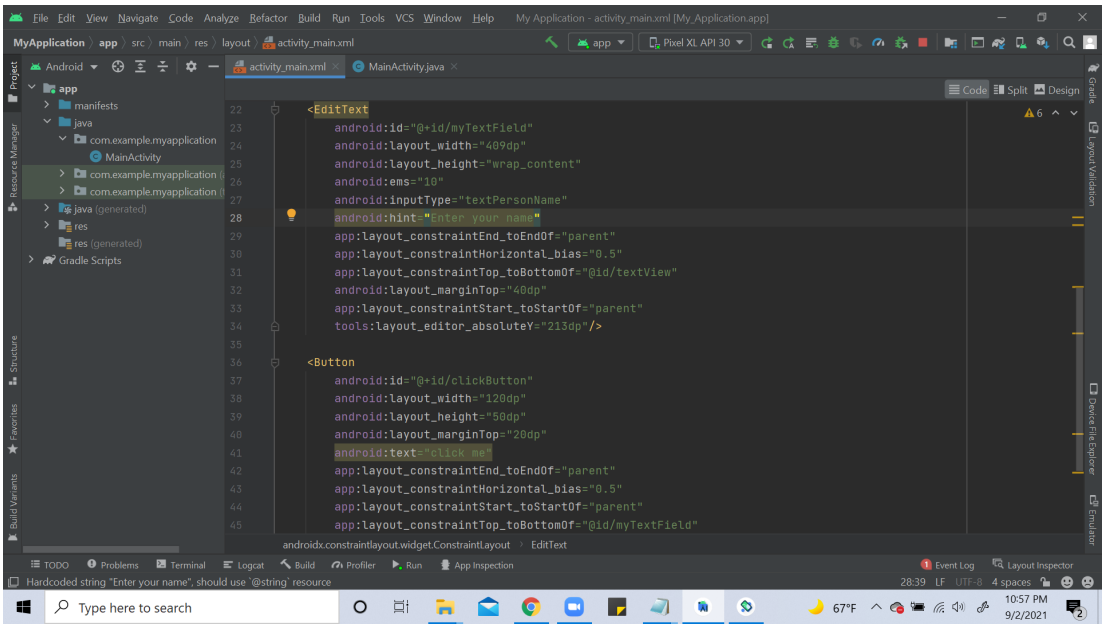
9. Now that we know how to work with a button, we will learn how to use text fields to take user input and how to use toasts to display output.

10. To create a text field, switch to activity_main.xml. Follow the same instructions as you did to create a new button.

a. If you use the "Design" tab, drag a "Plain Text" component to the center of the screen. Assign attributes as needed.

OR

b. If you use the "Code" tab, create a new EditText component as shown below. Assign properties as you like. **Remember** to assign an id to the component.



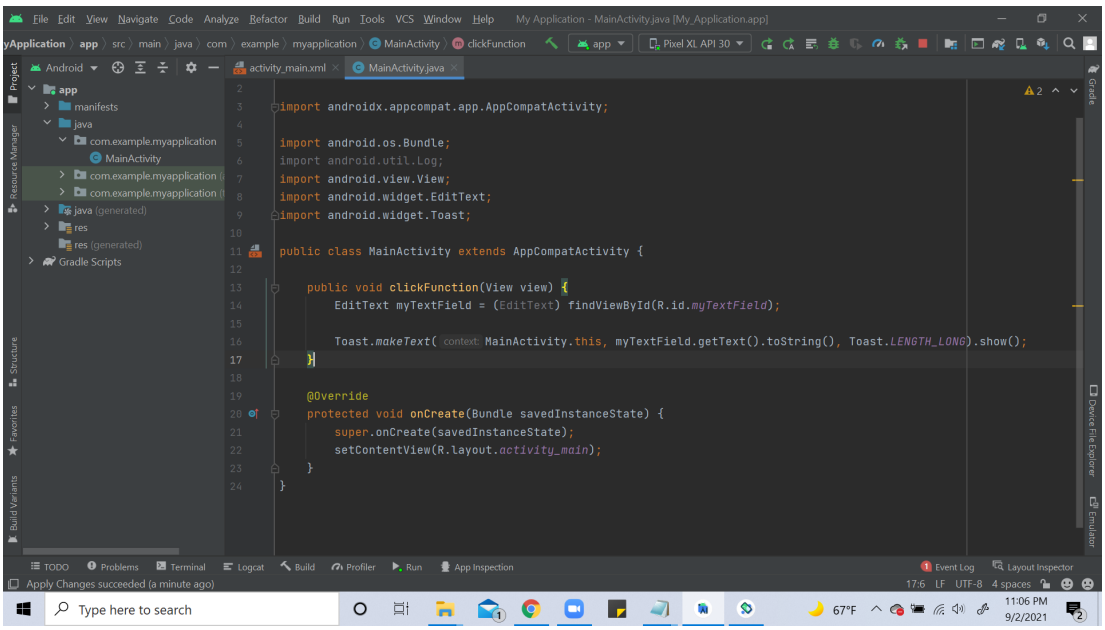
Setting up editText (text field)

11. Note that in Button, one of the constraint attribute is modified to align with the created editText as app:layout_constraintTop_toBottomOf="@id/myTextField"

12. We want to display the text that the user enters in the text field. We can do this using toasts.

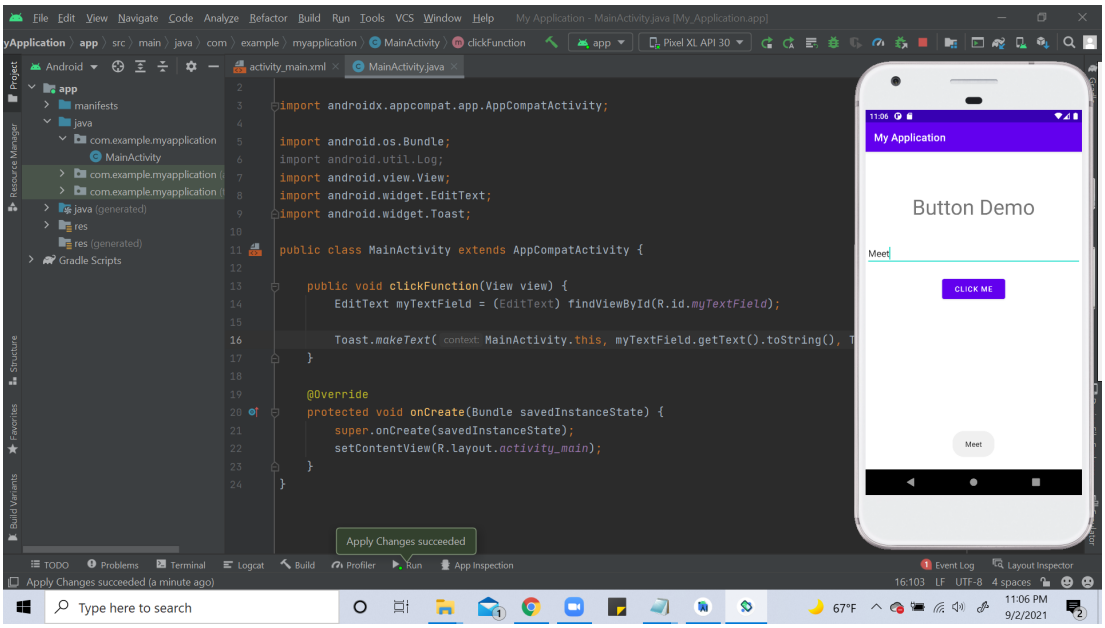
13. To get the text that the user entered in the text field, switch to MainActivity.java and create an EditText variable as shown below. We use the findViewById() method to find the descendant view with the given id. Make sure your id matches the id of the editText component.

14. Finally, we use the getText() method to get the text that the user entered in the text field. We can display that information using Toast as shown in the following snapshot.



Getting input from text field and creating a Toast

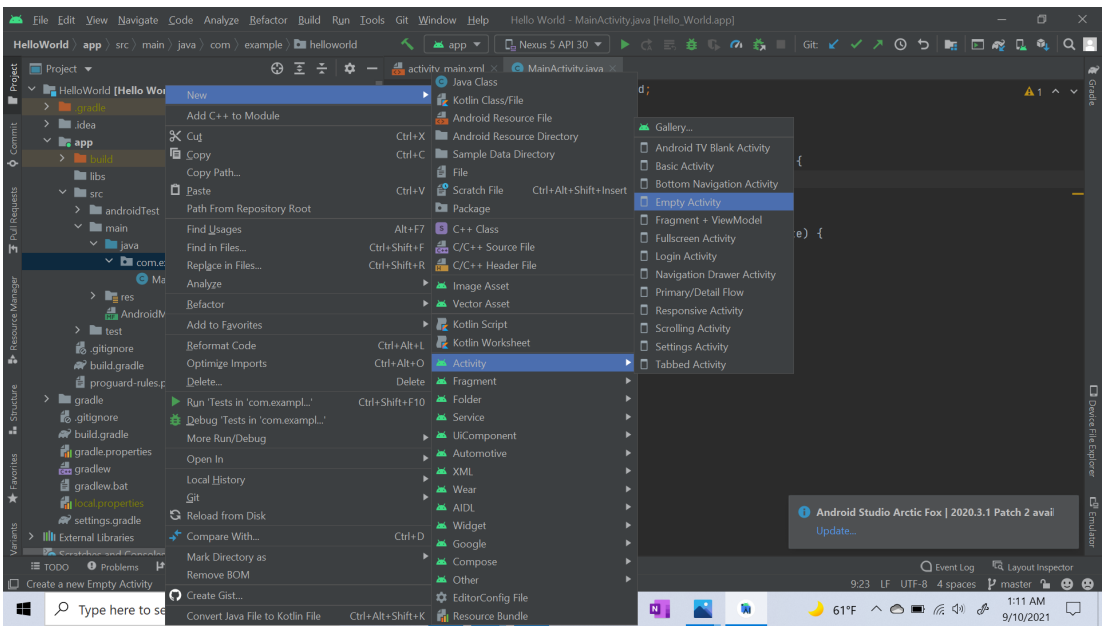
DEMO OUTPUT

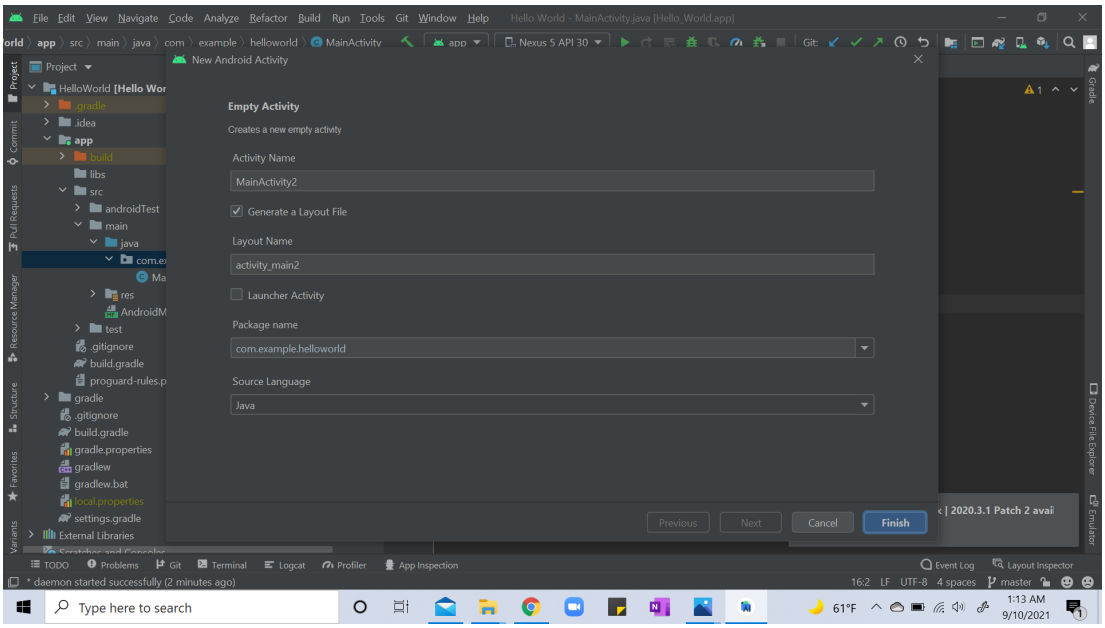


Demo output

15. Now we will learn to use intents in our mobile apps and how to pass some data from one activity to another.

16. First, let's create a new activity in the same project that we are doing. To create a new activity, right-click on com.example.your-project-name in the "Project" tab on the left side of Android studio. Select New -> Activity -> Empty Activity. Here are some snapshots to help you.

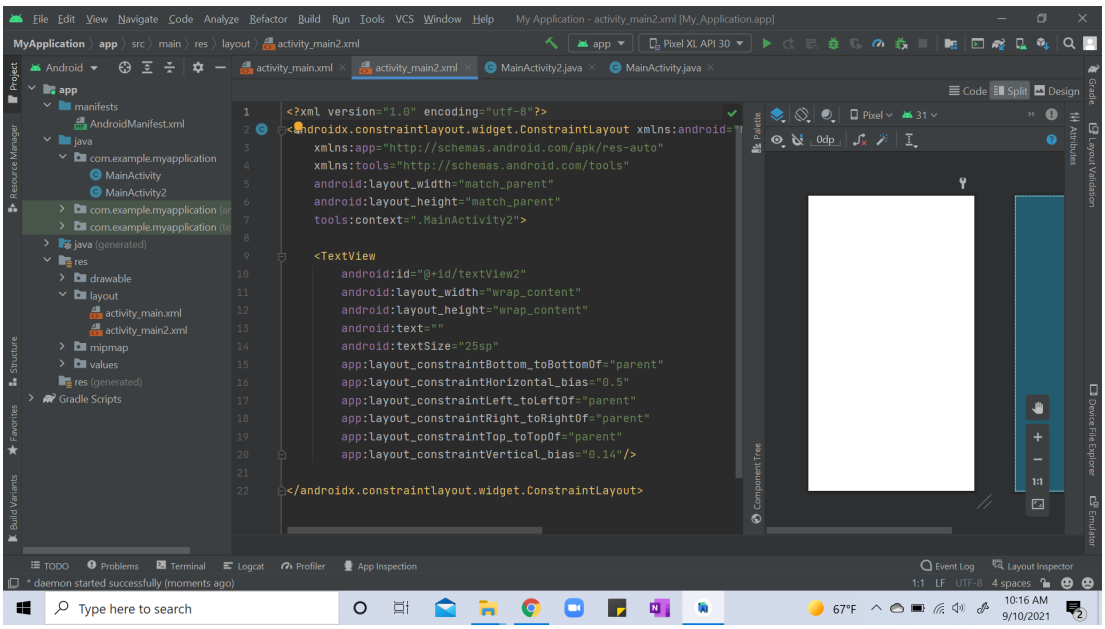




Creating new activity

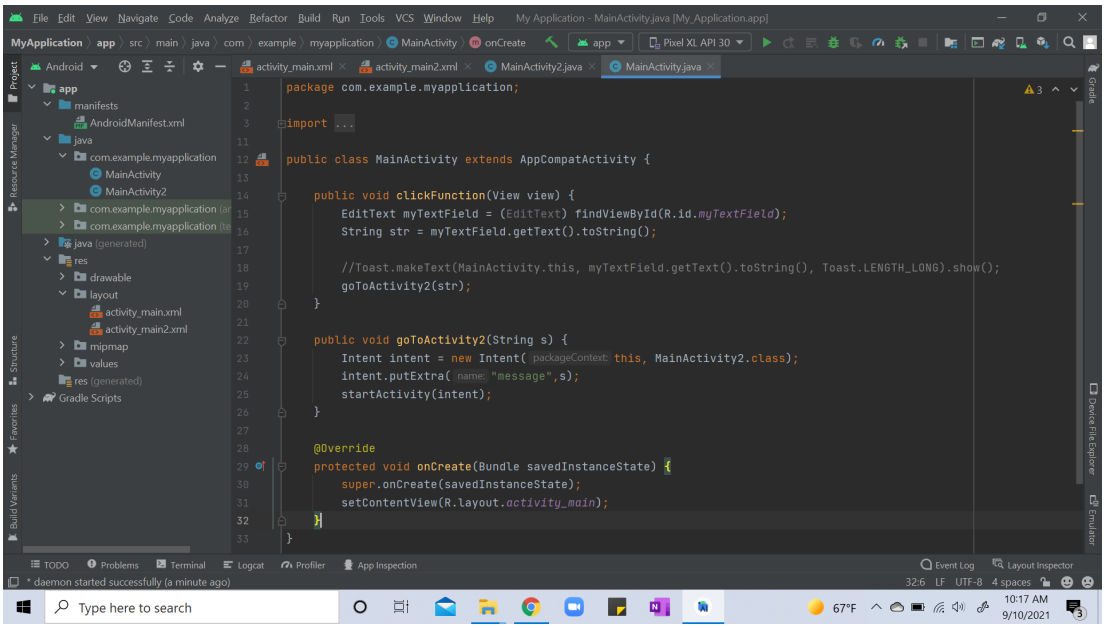
17. Next, we want to change what happens when the button is clicked. Instead of showing a toast like before, we will switch to a new activity when the “Click Me” button is clicked.

18. To do this, let’s create a new TextView in our new Activity’s xml file, activity_main2.xml, where we’ll show the output. Keep the text attribute empty for now. Here’s a snapshot:



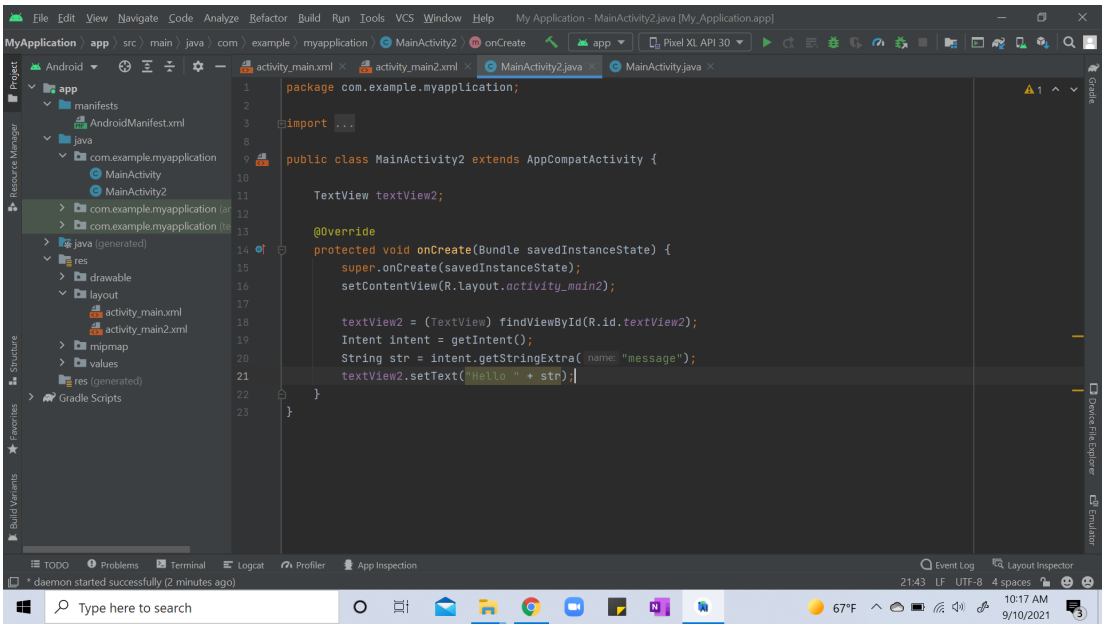
Creating new textView

19. Next we will create an intent in our Main Activity which will help us switch activities. Go to MainActivity.java. You do not need to remove the toast. You can comment it if you want. Create a new function called goToActivity2() like in the snapshot below. Create an intent in the function like in the snapshot. The putExtra() function helps us pass data to the second activity. In this case, we are using putExtra() to pass the string that we want to output to the new activity. Call this goToActivity2() method in the clickFunction() method so that it is called when the button is clicked.



Creating intent

20. Now go to the second activity, i.e. MainActivity2.java. Create a TextView instance to show the string we are going to get from the intent. In the onCreate() method, create an instance of the TextView we created earlier in actvity_main2.xml. We will use the “getStringExtra()” method to get the string from the previous activity. And then we will use the setText() method to set the text for the TextView. Here’s what the code would look like.



TextView getText() and setText()

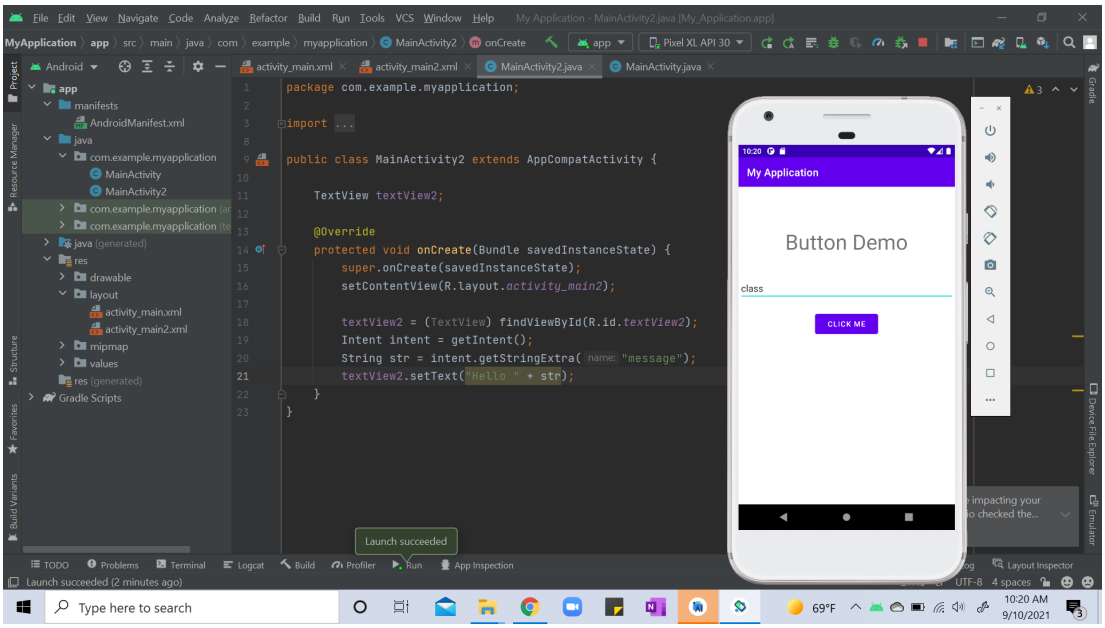
DELIVERABLES:

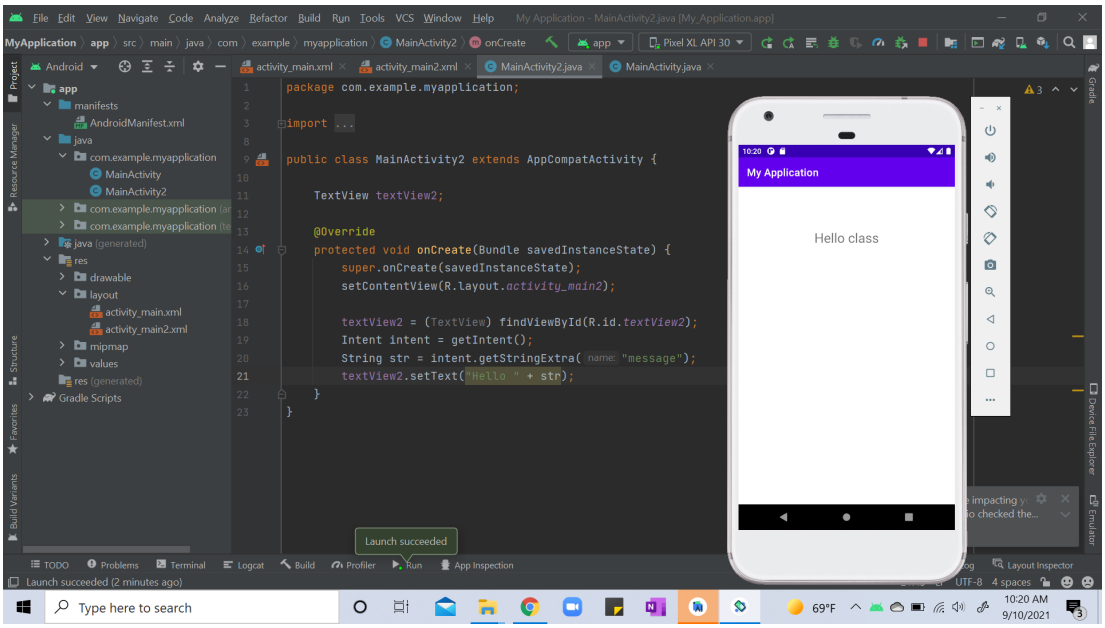
Good job, you have finished milestone 1. You need to show verify the following things:

- The TextView, EditText and Button in a presentable format on your emulator
- Correctly being able to enter input in the EditText component
- On clicking the button, it should take us to a new activity where the output is displayed.
- The output displayed must be taken from the user-entered text in the EditText Component in the first activity.

- Commit and push changes to the repo

- **Here is a Demo Output:**

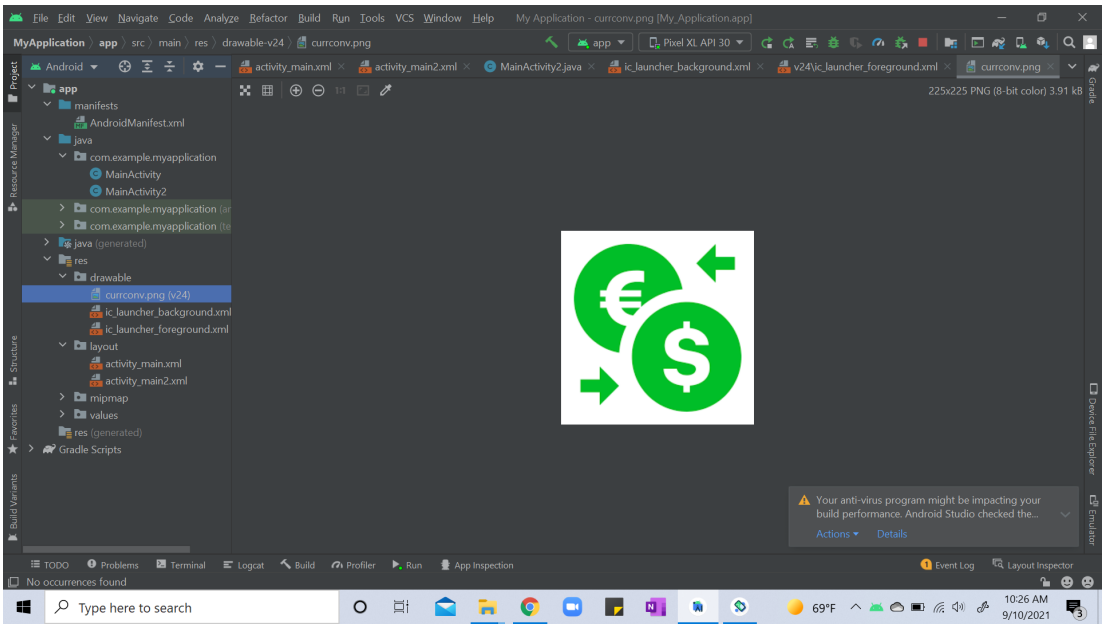




Demo output

Note: This section provides information on how to work with images in your Android app. There is no need to show a demo for this.

1. Download a suitable image for the app from the web.
2. Copy the image to the drawable folder found inside the res folder. You can do this by either dragging the image as shown in the below image or copying the desired image in the drawable folder found by the path "AndroidStudioProjects\<proj_name>r\app\src\main\res\drawable-v24"
3. Next create an ImageView in activity_main.xml by either dragging an ImageView component on the screen in the “Design” tab or by creating an ImageView in the “Text” tab. To add the Image to the ImageView, under the “src” attribute, write “@drawable/name-of-your-image”. Before doing so, make sure the image was copied into the drawable folder in the previous step.



Milestone 2 - Basic calculator app

Using the components we learnt in the previous milestone, we will create a basic calculator app which performs addition, subtraction, multiplication and division operations.

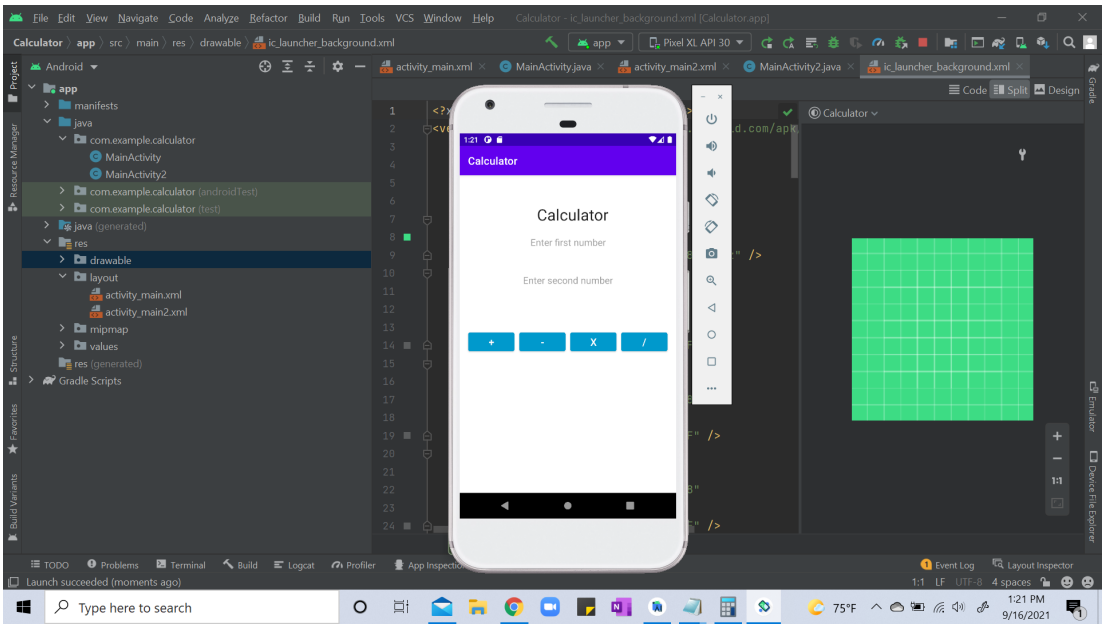
1. In this section, we are going to create a basic calculator app
2. Create a new project in Android Studio to create the basic calculator app
3. In our new Activity's xml file, add a TextView to display the string "Calculator" on top of the application
4. Insert two EditText components to get two integer numbers as input from the user
5. Add buttons for addition, subtraction, multiplication and division operations
6. Create another activity and add a TextView component in it to display the result
7. After entering the two input numbers and pressing on any button operation, the user should be taken to a new screen to see the final result of the operation (Review switching activities using Intent)
8. Check if you have included the appropriate constraints and the app looks presentable

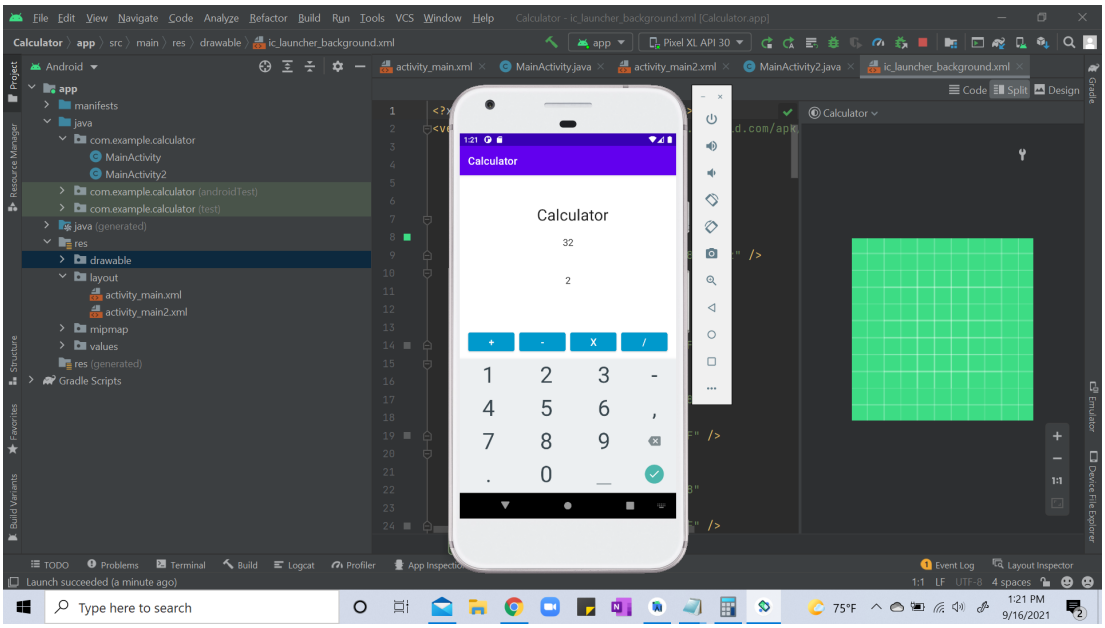
DELIVERABLES:

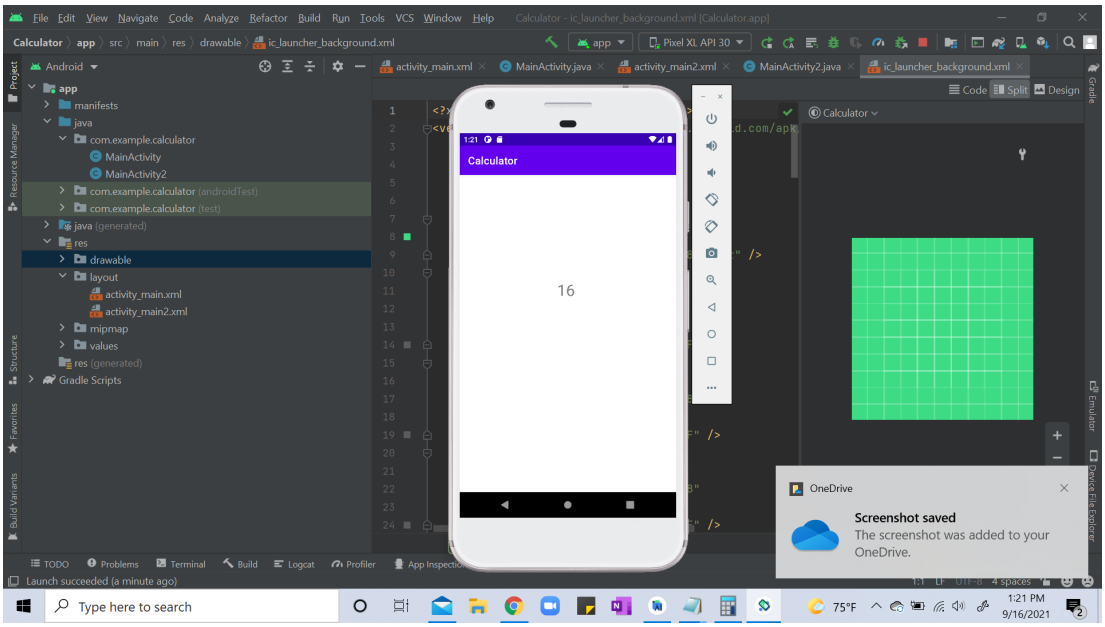
Good job on finishing the milestones! After completion, you need to verify the following thing:

- The basic calculator app in a presentable format
- PlainText text-fields are taking inputs correctly
- The output is being displayed in a new activity
- The addition, subtraction, division, multiplication operations on integer number inputs are correct.
- The fully functioning basic calculator app
- **Add this project to your own github repo (not to classroom repo)**
- **Show all the milestones output to TA and get your Lab 2 checked off.**

- **Here are the Demo Output screens:**







Conclusion:

Nice job getting through this lab! You have created your first interactive app! There are a lot more things you can do with the Android components. You can learn more about these components at the

following link: https://developer.android.com/training/basics/firstapp/building-ui (https://developer.android.com/training/basics/firstapp/building-ui)

References:

- https://developer.android.com/studio/write/layout-editor (https://developer.android.com/studio/write/layout-editor)
- https://developer.android.com/training/basics/firstapp/building-ui (https://developer.android.com/training/basics/firstapp/building-ui)
- https://developer.android.com/training/constraint-layout (https://developer.android.com/training/constraint-layout)

Lab 2 Rubric

Criteria	Ratings			Pts
Milestone 1 - TextView, EditText and Button in a presentable format	**1 pts** **Full Marks**		**0 pts** **No Marks**	1 pts
Milestone 1 - Correctly being able to enter input in the EditText component	**1 pts** **Full Marks**		**0 pts** **No Marks**	1 pts
Milestone 1 - Clicking the button takes us to a new activity where the output is displayed	**1 pts** **Full Marks**		**0 pts** **No Marks**	1 pts
Milestone 1 - Output displayed is taken from the user-entered text in the EditText Component in the first activity	**1 pts** **Full Marks**		**0 pts** **No Marks**	1 pts
Milestone 1 - Commit and push changes to GitHub to classroom repo	**0.5 pts** **Full Marks**		**0 pts** **No Marks**	0.5 pts
Milestone 2 - Basic calculator app in a presentable format	**0.5 pts** **Full Marks**		**0 pts** **No Marks**	0.5 pts
Milestone 2 - Basic calculator app - PlainText text-fields are taking inputs correctly	**0.5 pts** **Full Marks**		**0 pts** **No Marks**	0.5 pts
Milestone 2 - Basic calculator app - Output is being displayed in a new activity	**2 pts** **Full Marks**		**0 pts** **No Marks**	2 pts
Milestone 2 - Basic calculator app - Addition, subtraction, division, multiplication operations on integer number inputs are correct	**2 pts** **Full Marks**	**1 pts** **Relevant code present, but demo is not working**	**0 pts** **No Marks**	2 pts
Milestone 2 - Basic calculator app - Commit and push changes to GitHub to private repo (not classroom repo)	**0.5 pts** **Full Marks**		**0 pts** **No Marks**	0.5 pts

Criteria	Ratings	Pts
		Total Points: 10