Lesson 4.1: Clickable images

Introduction

The user interface (UI) that appears on a screen of an Android-powered device consists of a hierarchy of objects called *views*. Every element of the screen is a `View`.

The `View` class represents the basic building block for all UI components. `View` is the base class for classes that provide interactive UI components, such as `Button` elements. A `Button` is a UI element the user can tap or click to perform an action.

You can turn any `View`, such as an `ImageView`, into a UI element that can be tapped or clicked. You must store the image for the `ImageView` in the `drawables` folder of your project.

In this practical, you learn how to use images as elements that the user can tap or click.

What you should already know

You should be able to:

- Create an Android Studio project from a template and generate the main layout.
- Run apps on the emulator or a connected device.
- Create and edit UI elements using the layout editor and XML code.
- Access UI elements from your code using `findViewById()`.
- Handle a `Button` click.
- Display a `Toast` message.
- Add images to a project's `drawable` folder.

What you'll learn

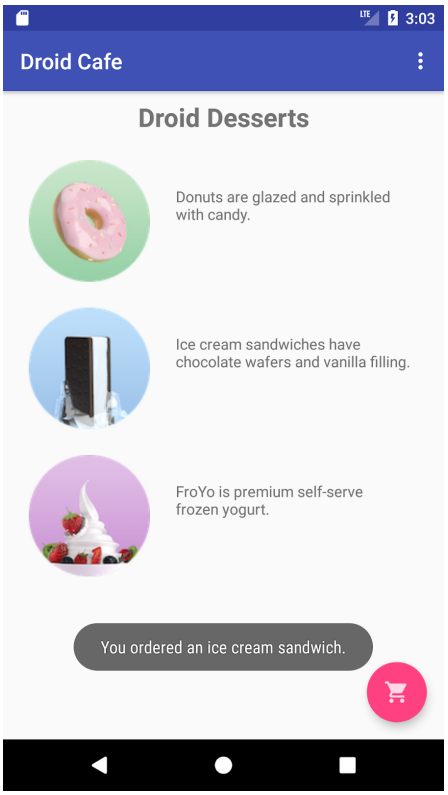
- How to use an image as an interactive element to perform an action.
- How to set attributes for `ImageView` elements in the layout editor.
- How to add an `onClick()` method to display a `Toast` message.

What you'll do

- Create a new Android Studio project for a mock dessert-ordering app that uses images as interactive elements.
- Set `onClick()` handlers for the images to display different `Toast` messages.
- Change the floating action button supplied by the template so that it shows a different icon and launches another `Activity`.

App overview

In this practical, you create and build a new app starting with the Basic Activity template that imitates a dessert-ordering app. The user can tap an image to perform an action—in this case display a `Toast` message—as shown in the figure below. The user can also tap a shopping-cart button to proceed to the next `Activity`.



Task 1: Add images to the layout

You can make a view clickable, as a button, by adding the `android:onClick` attribute in the XML layout. For example, you can make an image act like a button by adding `android:onClick` to the `ImageView`.

In this task you create a prototype of an app for ordering desserts from a café. After starting a new project based on the Basic Activity template, you modify the "Hello World" `TextView` with appropriate text, and add images that the user can tap.

1.1 Start the new project

1. Start a new Android Studio project with the app name **Droid Cafe**.
2. Choose the **Basic Activity** template, and accept the default `Activity` name (`MainActivity`). Make sure the **Generate Layout file** and **Backwards Compatibility (AppCompat)** options are selected.
3. Click **Finish**.

   The project opens with two layouts in the **res > layout** folder: `activity_main.xml` for the app bar and floating action button (which you don't change in this task), and `content_main.xml` for everything else in the layout.

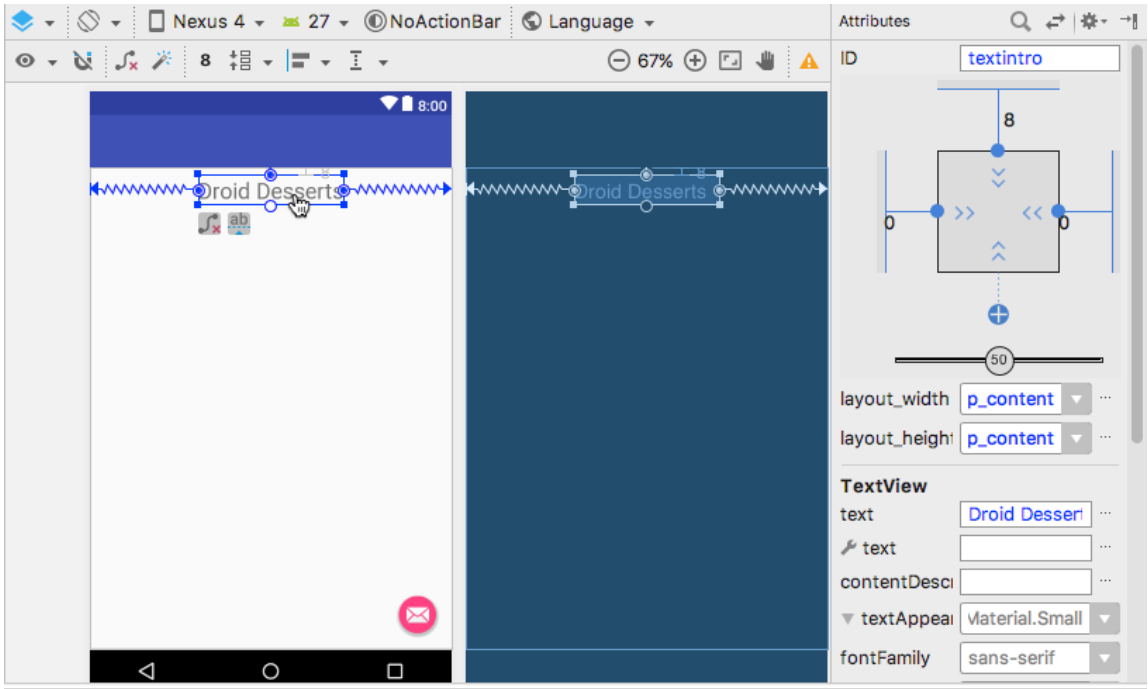
4. Open **content_main.xml** and click the **Design** tab (if it is not already selected) to show the layout editor.
5. Select the "Hello World" `TextView` in the layout and open the **Attributes** pane.
6. Change the `textintro` attributes as follows:

Attribute field	**Enter the following:**

`ID`	`textintro`
`text`	Change `Hello World` to Droid Desserts
`textStyle`	`B` (bold)
`textSize`	`24sp`

This adds the `android:id` attribute to the `TextView` with the `id` set to `textintro`, changes the text, makes the text bold, and sets a larger text size of `24sp`.

7. Delete the constraint that stretches from the bottom of the `textintro` `TextView` to the bottom of the layout, so that the `TextView` snaps to the top of the layout, and choose **8** (8dp) for the top margin as shown below.



8. In a previous lesson you learned how to extract a string resource from a literal text string. Click the **Text** tab to switch to XML code, and extract the `"Droid Desserts"` string in the

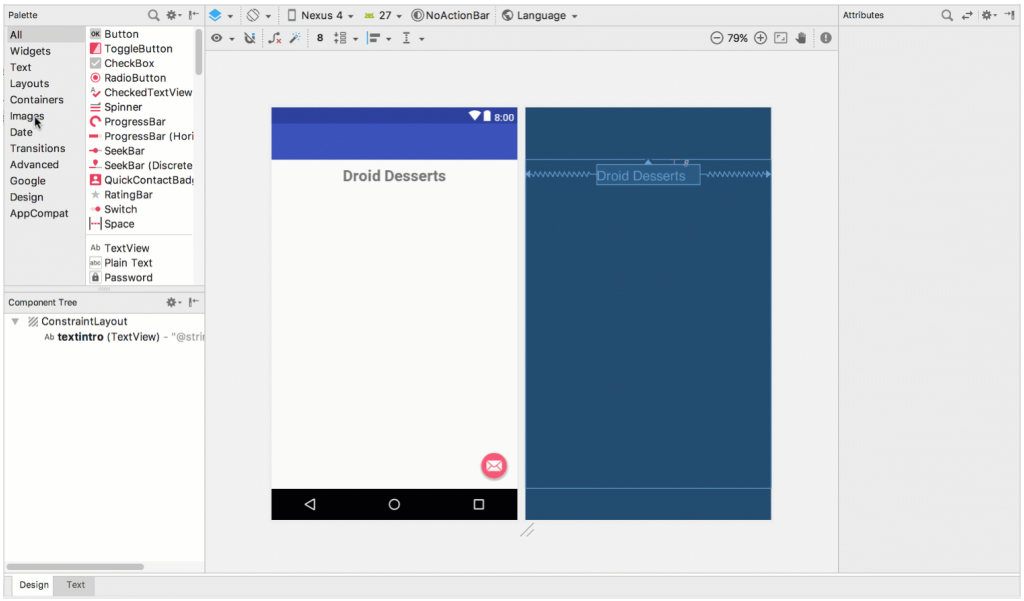
`TextView` and enter **intro_text** as the string resource name.

1.2 Add the images

Three images (`donut_circle.png`, `froyo_circle.png`, and `icecream_circle.png`) are provided for this example, which you can download. As an alternative, you can substitute your own images as PNG files, but they must be sized at about 113 x 113 pixels to use in this example.

This step also introduces a new technique in the layout editor: using the **Fix** button in warning messages to extract string resources.

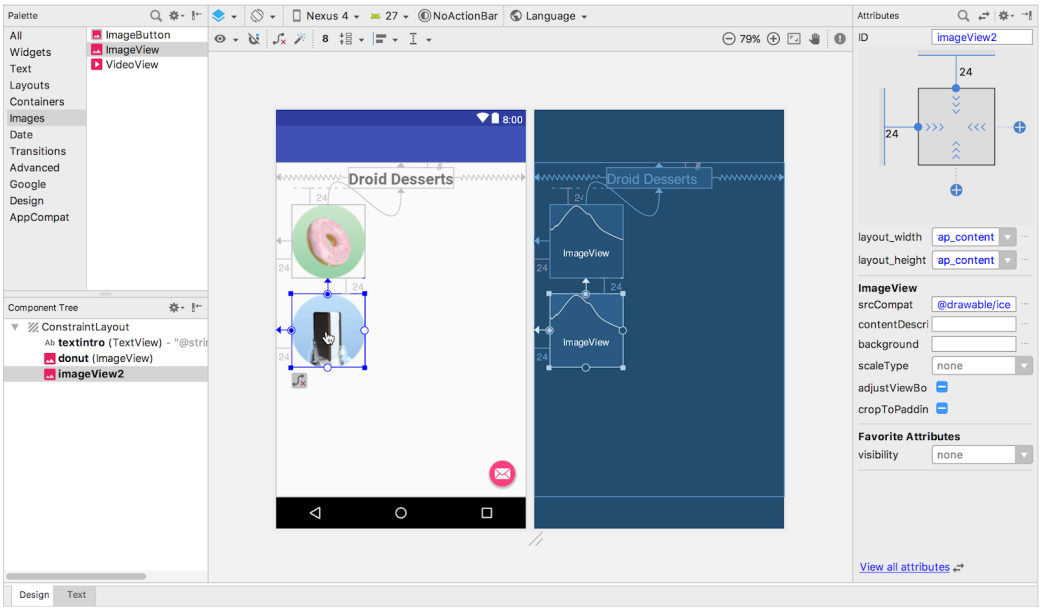
1. To copy the images to your project, first close the project.
2. Copy the image files into your project's **drawable** folder. Find the **drawable** folder in a project by using this path: *project_name* **> app > src > main > res > drawable**.
3. Reopen your project.
4. Open **content_main.xml** file, and click the **Design** tab (if it is not already selected).
5. Drag an `ImageView` to the layout, choose the **donut_circle** image for it, and constrain it to the top `TextView` and to the left side of the layout with a margin of **24** (24dp) for both constraints, as shown in the animated figure below.



6. In the **Attributes** pane, enter the following values for the attributes:

Attribute field	**Enter the following:**
`ID`	`donut`
contentDescription	`Donuts are glazed and sprinkled with candy.` (You can copy/paste the text into the field.)

7. Drag a second `ImageView` to the layout, choose the **icecream_circle** image for it, and constrain it to the bottom of the first `ImageView` and to the left side of the layout with a margin of **24** (24dp) for both constraints.



8. In the **Attributes** pane, enter the following values for the attributes:

Attribute field	**Enter the following:**
`ID`	`ice_cream`
`contentDescription`	`Ice cream sandwiches have chocolate wafers and vanilla filling.` (You can copy/paste the text into the field.)

9. Drag a third `ImageView` to the layout, choose the **froyo_circle** image for it, and constrain it to the bottom of the second `ImageView` and to the left side of the layout with a margin of **24** (24dp) for both constraints.

10. In the **Attributes** pane, enter the following values for the attributes:

Attribute field	**Enter the following:**
`ID`	`froyo`

`contentDescription`	`FroYo is premium self-serve frozen yogurt.` (You can copy/paste the text into the field.)

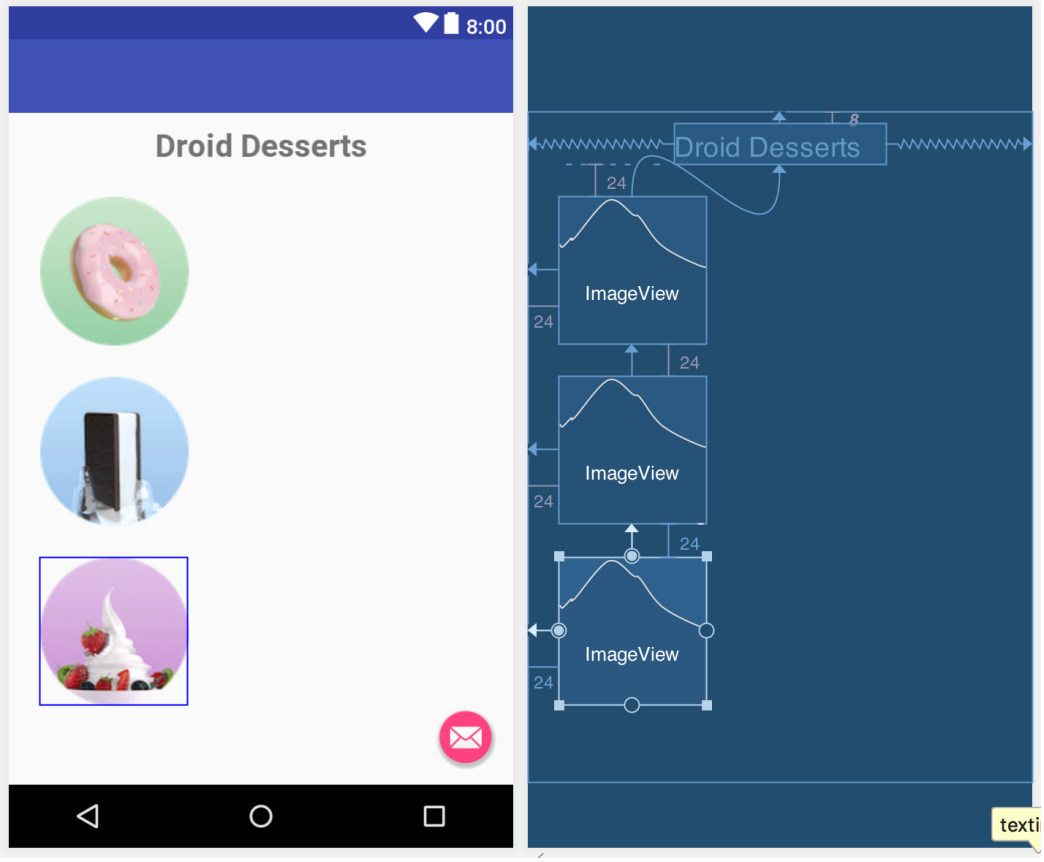
11. Click the warning icon in the upper left corner of the layout editor to open the warning pane, which should display warnings about hardcoded text:

12. Expand each **Hardcoded text** warning, scroll to the bottom of the warning message, and click the **Fix** button as shown below:

The fix for each hardcoded text warning extracts the string resource for the string. The **Extract Resource** dialog appears, and you can enter the name for the string resource. Enter the following names for the string resources:

String	**Enter the following name:**
`Donuts are glazed and sprinkled with candy.`	`donuts`
`Ice cream sandwiches have chocolate wafers and vanilla filling.`	`ice_cream_sandwiches`
`FroYo is premium self-serve frozen yogurt.`	`froyo`

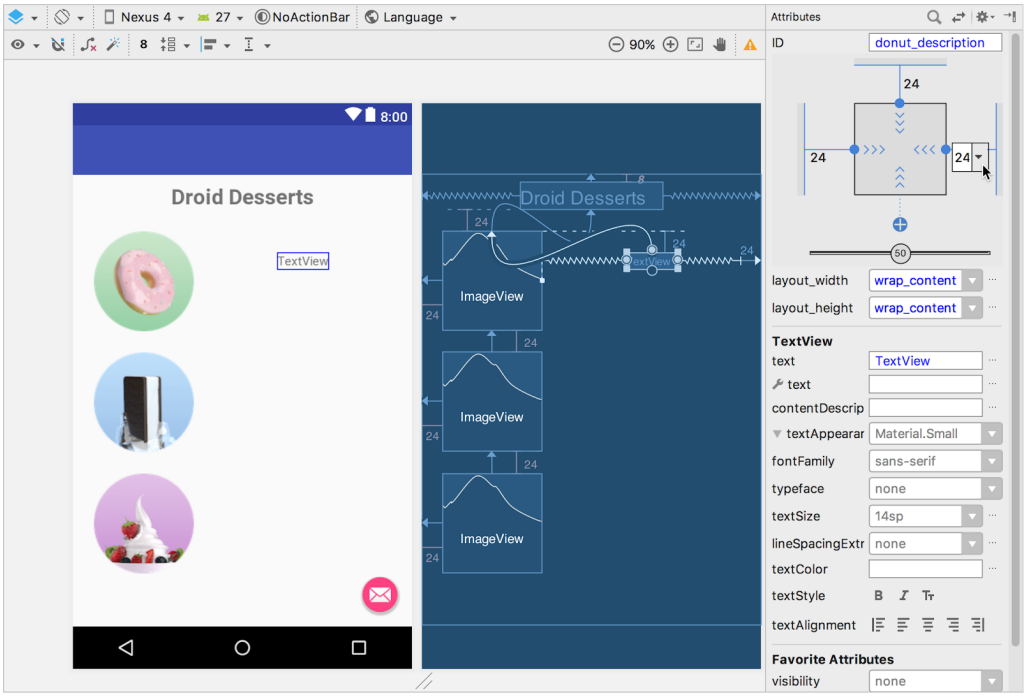
The layout should now look like the figure below.



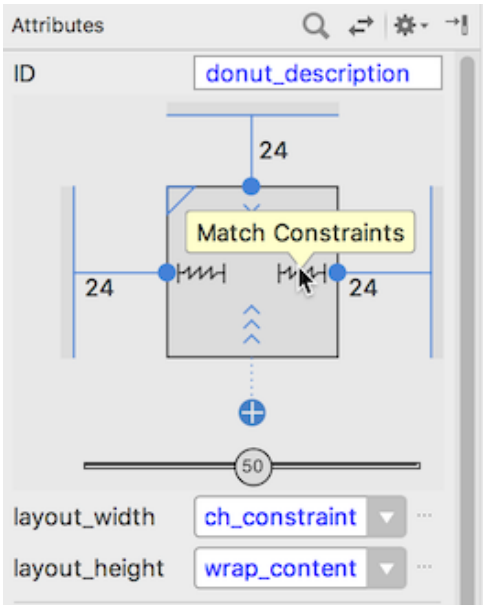
1.3 Add the text descriptions

In this step you add a text description (`TextView`) for each dessert. Because you have already extracted string resources for the `contentDescription` fields for the `ImageView` elements, you can use the same string resources for each description `TextView`.

1. Drag a `TextView` element to the layout.
2. Constrain the element's left side to the right side of the `donut ImageView` and its top to the top of the `donut ImageView`, both with a margin of **24** (24dp).
3. Constrain the element's right side to the right side of the layout, and use the same margin of **24** (24dp). Enter **donut_description** for the `ID` field in the **Attributes** pane. The new `TextView` should appear next to the donut image as shown in the figure below.

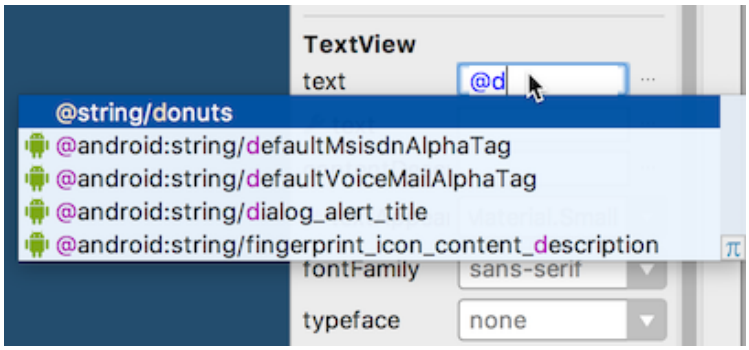


4. In the **Attributes** pane change the width in the inspector pane to **Match Constraints**:



5. In the **Attributes** pane, begin entering the string resource for the `text` field by prefacing it with the **@** symbol: **@d**. Click the string resource name (**@string/donuts**) which appears as a

suggestion:



6. Repeat the steps above to add a second `TextView` that is constrained to the right side and top of the `ice_cream` `ImageView`, and its right side to the right side of the layout. Enter the following in the **Attributes** pane:

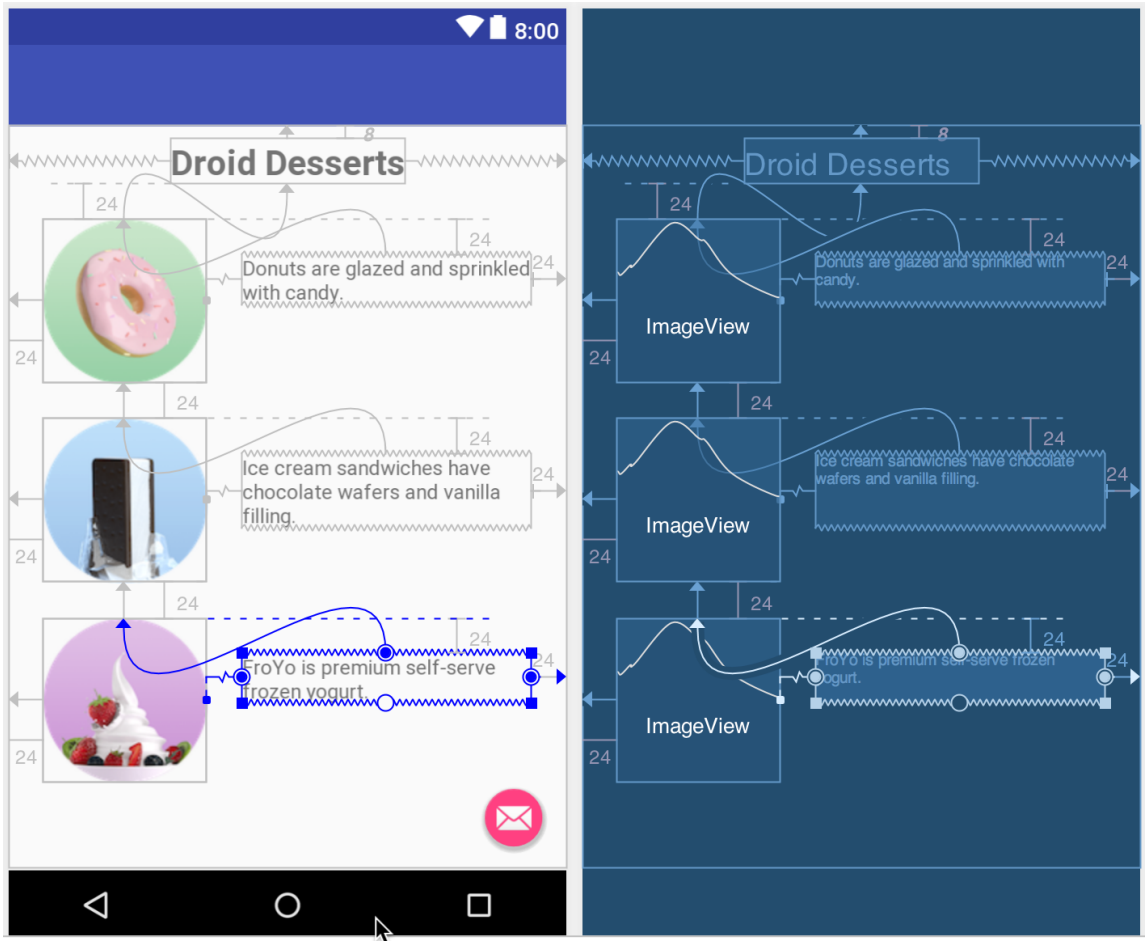
Attribute field	**Enter the following:**
`ID`	`ice_cream_description`
Left, right, and top margins	`24`
`layout_width`	`match_constraint`
`text`	`@string/ice_cream_sandwiches`

7. Repeat the steps above to add a third `TextView` that is constrained to the right side and top of the `froyo` `ImageView`, and its right side to the right side of the layout. Enter the following in the **Attributes** pane:

Attribute field	**Enter the following:**
`ID`	`froyo_description`
Left, right, and top margins	`24`
`layout_width`	`match_constraint`

`text`	`@string/froyo`

The layout should now look like the following:



Task 1 solution code

The XML layout for the content.xml file is shown below.

```
<?xml version="1.0" encoding="utf-8"?>
<android.support.constraint.ConstraintLayout
xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    app:layout_behavior="@string/appbar_scrolling_view_behavior"
    tools:context="com.example.android.droidcafe.MainActivity"
    tools:showIn="@layout/activity_main">

    <TextView
        android:id="@+id/textintro"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginTop="@dimen/margin_regular"
        android:text="@string/intro_text"
        android:textSize="@dimen/text_heading"
        android:textStyle="bold"
        app:layout_constraintLeft_toLeftOf="parent"
        app:layout_constraintRight_toRightOf="parent"
        app:layout_constraintTop_toTopOf="parent" />

    <ImageView
        android:id="@+id/donut"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="@dimen/margin_wide"
        android:layout_marginTop="@dimen/margin_wide"
        android:contentDescription="@string/donuts"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toBottomOf="@+id/textintro"
        app:srcCompat="@drawable/donut_circle" />

    <ImageView
        android:id="@+id/ice_cream"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="@dimen/margin_wide"
        android:layout_marginTop="@dimen/margin_wide"
        android:contentDescription="@string/ice_cream_sandwiches"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toBottomOf="@+id/donut"
```

```
        app:srcCompat="@drawable/icecream_circle" />

    <ImageView
        android:id="@+id/froyo"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="@dimen/margin_wide"
        android:layout_marginTop="@dimen/margin_wide"
        android:contentDescription="@string/froyo"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toBottomOf="@+id/ice_cream"
        app:srcCompat="@drawable/froyo_circle" />

    <TextView
        android:id="@+id/donut_description"
        android:layout_width="0dp"
        android:layout_height="wrap_content"
        android:layout_marginEnd="@dimen/margin_wide"
        android:layout_marginStart="@dimen/margin_wide"
        android:layout_marginTop="@dimen/margin_wide"
        android:text="@string/donuts"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toEndOf="@+id/donut"
        app:layout_constraintTop_toTopOf="@+id/donut" />

    <TextView
        android:id="@+id/ice_cream_description"
        android:layout_width="0dp"
        android:layout_height="wrap_content"
        android:layout_marginEnd="@dimen/margin_wide"
        android:layout_marginStart="@dimen/margin_wide"
        android:layout_marginTop="@dimen/margin_wide"
        android:text="@string/ice_cream_sandwiches"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toEndOf="@+id/ice_cream"
        app:layout_constraintTop_toTopOf="@+id/ice_cream" />

    <TextView
        android:id="@+id/froyo_description"
        android:layout_width="0dp"
        android:layout_height="wrap_content"
        android:layout_marginEnd="@dimen/margin_wide"
        android:layout_marginStart="@dimen/margin_wide"
        android:layout_marginTop="@dimen/margin_wide"
        android:text="@string/froyo"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toEndOf="@+id/froyo"
        app:layout_constraintTop_toTopOf="@+id/froyo" />
```

```
</android.support.constraint.ConstraintLayout>
```

Task 2: Add onClick methods for images

To make a `View` *clickable* so that users can tap (or click) it, add the `android:onClick` attribute in the XML layout and specify the click handler. For example, you can make an `ImageView` act like a simple `Button` by adding `android:onClick` to the `ImageView`. In this task you make the images in your layout clickable.

2.1 Create a Toast method

In this task you add each method for the `android:onClick` attribute to call when each image is clicked. In this task, these methods simply display a `Toast` message showing which image was tapped. (In another chapter you modify these methods to launch another `Activity`.)

1. To use string resources in Java code, you should first add them to the `strings.xml` file. Expand **res > values** in the **Project > Android** pane, and open **strings.xml**. Add the following string resources for the strings to be shown in the `Toast` message:

```
<string name="donut_order_message">You ordered a donut.</string>
<string name="ice_cream_order_message">You ordered an ice cream sandwich.</string>
<string name="froyo_order_message">You ordered a FroYo.</string>
```

2. Open **MainActivity**, and add the following `displayToast()` method to the end of **MainActivity** (before the closing bracket):

```
public void displayToast(String message) {
   Toast.makeText(getApplicationContext(), message,
                          Toast.LENGTH_SHORT).show();
}
```

Although you could have added this method in any position within **MainActivity**, it is best practice to put your own methods *below* the methods already provided in **MainActivity** by the template.

2.2 Create click handlers

Each clickable image needs a click handler—a method for the `android:onClick` attribute to call. The click handler, if called from the `android:onClick` attribute, must be `public`, return `void`, and define a `View` as its only parameter. Follow these steps to add the click handlers:

1. Add the following `showDonutOrder()` method to **MainActivity**. For this task, use the previously created `displayToast()` method to display a `Toast` message:

```
/**
* Shows a message that the donut image was clicked.
*/
public void showDonutOrder(View view) {
    displayToast(getString(R.string.donut_order_message));
}
```

The first three lines are a comment in the Javadoc format, which makes the code easier to understand and also helps generate documentation for your code. It is a best practice to add such a comment to every new method you create. For more information about how to write comments, see How to Write Doc Comments for the Javadoc Tool.

2. Add more methods to the end of **MainActivity** for each dessert:

```
/**
* Shows a message that the ice cream sandwich image was clicked.
*/
public void showIceCreamOrder(View view) {
    displayToast(getString(R.string.ice_cream_order_message));
}

/**
* Shows a message that the froyo image was clicked.
*/
public void showFroyoOrder(View view) {
    displayToast(getString(R.string.froyo_order_message));
}
```

3. (Optional) Choose **Code > Reformat Code** to reformat the code you added in `MainActivity` to conform to standards and make it easier to read.

2.3 Add the onClick attribute

In this step you add `android:onClick` to each of the `ImageView` elements in the `content_main.xml` layout. The `android:onClick` attribute calls the click handler for each element.

1. Open the **content_main.xml** file, and click the **Text** tab in the layout editor to show the XML code.
2. Add the `android:onClick` attribute to `donut` ImageView. As you enter it, suggestions appear showing the click handlers. Select the `showDonutOrder` click handler. The code should now look as follows:

```
<ImageView
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
```

```
        android:padding="10dp"
        android:id="@+id/donut"
        android:layout_below="@id/choose_dessert"
        android:contentDescription="@string/donut"
        android:src="@drawable/donut_circle"
        android:onClick="showDonutOrder"/>
```

The last line (`android:onClick="showDonutOrder"`) assigns the click handler (`showDonutOrder`) to the `ImageView`.

3. (Optional) Choose **Code > Reformat Code** to reformat the XML code you added in `content_main.xml` to conform to standards and make it easier to read. Android Studio automatically moves the `android:onClick` attribute up a few lines to combine them with the other attributes that have `android:` as the preface.
4. Follow the same procedure to add the `android:onClick` attribute to the `ice_cream` and `froyo` `ImageView` elements. Select the `showDonutOrder` and `showFroyoOrder` click handlers. You can optionally choose **Code > Reformat Code** to reformat the XML code. The code should now look as follows:

```
<ImageView

        android:id="@+id/ice_cream"

        android:layout_width="wrap_content"

        android:layout_height="wrap_content"

        android:layout_marginStart="@dimen/margin_wide"

        android:layout_marginTop="@dimen/margin_wide"

        android:contentDescription="@string/ice_cream_sandwiches"

        android:onClick="showIceCreamOrder"

        app:layout_constraintStart_toStartOf="parent"

        app:layout_constraintTop_toBottomOf="@+id/donut"

        app:srcCompat="@drawable/icecream_circle" />
```

```
<ImageView
        android:id="@+id/froyo"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginStart="@dimen/margin_wide"
        android:layout_marginTop="@dimen/margin_wide"
        android:contentDescription="@string/froyo"
        android:onClick="showFroyoOrder"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toBottomOf="@+id/ice_cream"
        app:srcCompat="@drawable/froyo_circle" />
```

Note that the attribute `android:layout_marginStart` in each `ImageView` is underlined in red. This attribute determines the "start" margin for the `ImageView`, which is on the left side for most languages but on the right side for languages that read right-to-left (RTL).

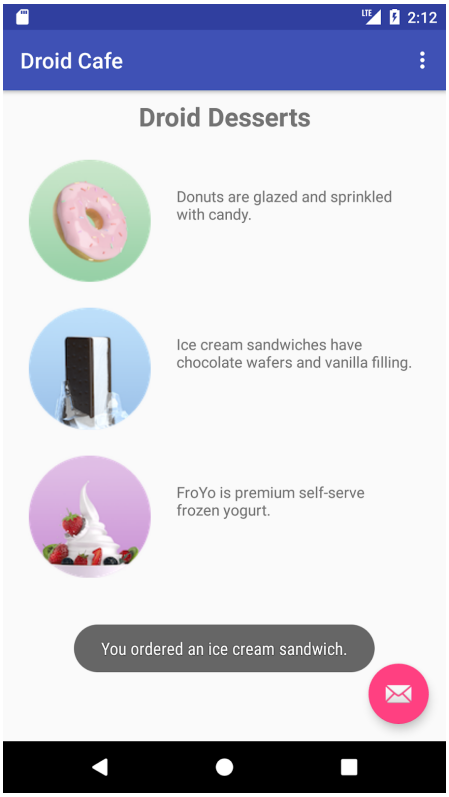
5. Click the `android:` preface part of the `android:layout_marginStart` attribute, and a red bulb warning appears next to it, as shown in the figure below.

```
<ImageView
    android:id="@+id/ice_cream"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginStart="@dimen/margin_wide"
    android:layout_marginTop="@dimen/margin_wide"
    android:contentDescription="@string/ice_cream_sandwiches"
    android:onClick="showIceCreamOrder"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintTop_toBottomOf="@+id/donut"
    app:srcCompat="@drawable/icecream_circle" />
```

6. To make your app compatible with previous versions of Android, click the red bulb for each instance of this attribute, and choose **Set layout_marginLeft...** to set the `layout_marginLeft` to `"@dimen/margin_wide"`.

7. Run the app.

Clicking the donut, ice cream sandwich, or froyo image displays a `Toast` message about the order, as shown in the figure below.



Task 2 solution code

The solution code for this task is included in the code and layout for `MainActivity` in the Android Studio project DroidCafe.

Task 3: Change the floating action button

When you click the floating action button with the email icon that appears at the bottom of the screen, the code in `MainActivity` displays a brief message in a drawer that opens from the bottom of the screen on a smartphone, or from the lower left corner on larger devices, and then closes after a few seconds. This is called a *snackbar*. It is used to provide feedback about an operation. For more information, see `Snackbar`.

Look at how other apps implement the floating action button. For example, the Gmail app provides a floating action button to create a new email message, and the Contacts app provides one to create a new contact. For more information about floating action buttons, see `FloatingActionButton`.

For this task you change the icon for the `FloatingActionButton` to a shopping cart  , and change the action for the `FloatingActionButton` to launch a new `Activity`.

3.1 Add a new icon

As you learned in another lesson, you can choose an icon from the set of icons in Android Studio. Follow these steps:

1. Expand **res** in the **Project > Android** pane, and right-click (or Control-click) the **drawable** folder.
2. Choose **New > Image Asset**. The Configure Image Asset dialog appears.
3. Choose **Action Bar and Tab Icons** in the drop-down menu at the top of the dialog. (Note that the *action bar* is the same thing as the *app bar*.)
4. Change **ic_action_name** in the **Name** field to **ic_shopping_cart**.
5. Click the clip art image (the Android logo next to **Clipart:**) to select a clip art image as the icon. A page of icons appears. Click the icon you want to use for the floating action button, such as the shopping cart icon.

6. Choose **HOLO_DARK** from the **Theme** drop-down menu. This sets the icon to be white against a dark-colored (or black) background. Click **Next**.
7. Click **Finish** in the Confirm Icon Path dialog.

Tip: For a complete description for adding an icon, see Create app icons with Image Asset Studio.

3.2 Add an Activity

As you learned in a previous lesson, an `Activity` represents a single screen in your app in which your user can perform a single, focused task. You already have one activity, `MainActivity.java`. Now you add another activity called `OrderActivity.java`.

1. Right-click (or Control-click) the **com.example.android.droidcafe** folder in the left column and choose **New > Activity > Empty Activity**.
2. Edit the **Activity Name** to be **OrderActivity**, and the **Layout Name** to be **activity_order**. Leave the other options alone, and click **Finish**.

The `OrderActivity` class should now be listed along with `MainActivity` in the **java** folder, and `activity_order.xml` should now be listed in the **layout** folder. The Empty Activity template added these files.

3.3 Change the action

In this step you change the action for the `FloatingActionButton` to launch the new `Activity`.

1. Open **MainActivity**.
2. Change the `onClick(View view)` method to make an explicit intent to start `OrderActivity`:

```
public void onClick(View view) {

    Intent intent = new Intent(MainActivity.this, OrderActivity.class);

    startActivity(intent);

}
```

3. Run the app. Tap the floating action button that now uses the shopping cart icon. A blank `Activity` should appear (`OrderActivity`). Tap the Back button to go back to `MainActivity`.

Task 3 solution code

The solution code for this task is included in the code and layout for Android Studio project DroidCafe.

Coding challenge

Note: All coding challenges are optional and are not prerequisites for later lessons.

Challenge: The DroidCafe app's `MainActivity` launches a second `Activity` called `OrderActivity`.

You learned in another lesson how to send data from an `Activity` to another `Activity`. Change the app to send the order message for the selected dessert in `MainActivity` to a new `TextView` at the top of the `OrderActivity` layout.

1. Add a `TextView` at the top of the `OrderActivity` layout with the id `order_textview`.
2. Create a member variable (`mOrderMessage`) in `MainActivity` for the order message that appears in the `Toast`.
3. Change the `showDonutOrder()`, `showIceCreamOrder()`, and `showFroyoOrder()` click handlers to assign the message string `mOrderMessage` before displaying the `Toast`. For example, the following assigns the `donut_order_message` string to `mOrderMessage` and displays the `Toast`:

```
mOrderMessage = getString(R.string.donut_order_message);
displayToast(mOrderMessage);
```

4. Add a `public static final String` called `EXTRA_MESSAGE` to the top of `MainActivity` to define the key for an `intent.putExtra`:

```
public static final String EXTRA_MESSAGE =
                    "com.example.android.droidcafe.extra.MESSAGE";
```

5. Change the `onClick()` method to include the `intent.putExtra` statement before launching `OrderActivity`:

```
public void onClick(View view) {
    Intent intent =
            new Intent(MainActivity.this, OrderActivity.class);
    intent.putExtra(EXTRA_MESSAGE, mOrderMessage);
    startActivity(intent);
}
```

6. In `OrderActivity`, add the following code to the `onCreate()` method to get the `Intent` that launched the `Activity`, extract the string message, and replace the text in the `TextView` with the message:

```
Intent intent = getIntent();
String message = "Order: " +
                  intent.getStringExtra(MainActivity.EXTRA_MESSAGE);
TextView textView = findViewById(R.id.order_textview);
textView.setText(message);
```

7. Run the app. After choosing a dessert image, tap the floating action button to launch `OrderActivity`, which should include the order message as shown in the figure below.