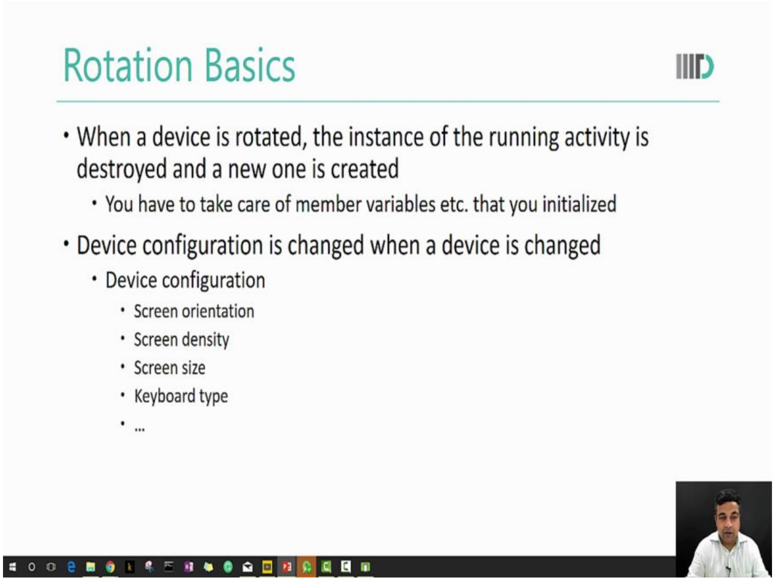
Mobile Computing
Professor Pushpendra Singh
Indraprastha Institute of Information Technology Delhi
Lecture 18
Handling Rotation

Hello, welcome to your Android class. So far you have learned how to create simple Android application consisting of a single activity. You also learned to create a basic UI using an XML file and also using the Android Studio Design. In that we also learned how to add icons to the buttons and other widgets and we also learned how to do logging to do debugging as well as to see how our activity life cycle is being play out in the background when we are interacting with our application. One problem that we faced last time was that when we rotated our screen our application started from the beginning. That is it displayed us the first question.

This was a bug and this bug occurred because we were not handling what happens to an application when we rotate. After putting some log messages we came to know that when we rotate an application, the activity that is currently active is destroyed and new activity is created. Today we will learn how to manage the behavior of our application, how to keep the application behavior consistent when a user rotates the screen, let us start.

(Refer Slide Time: 1:46)



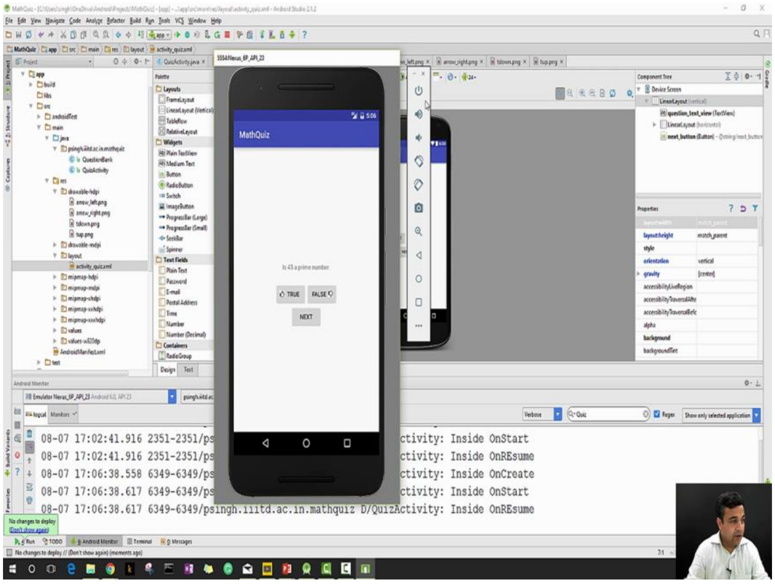
Rotation Basics

- When a device is rotated, the instance of the running activity is destroyed and a new one is created
  - You have to take care of member variables etc. that you initialized
- Device configuration is changed when a device is changed
  - Device configuration
    - Screen orientation
    - Screen density
    - Screen size
    - Keyboard type
    - ...

Just to recap when a device is rotated, the instance of the running activity is destroyed and then a new one is created. And in this case you have to take care of member variables etc. that you initialized. In our application we had our current index variable of the array that you are initializing and whenever you are rotating it used to get initialized to zero. Now we will see how to save it so that its value is preserved during the rotation. For the basics when you rotate a device, the device configuration is changed. So let us see what is in a device configuration. A device configuration consists of screen orientation, screen density, screen size, keyboard type and many other things. Many of these things are not affected at all when you rotate your screen for example the screen density remains the same.

However, many other things get affected when you rotate your mobile phone such as the screen orientation; now because your device configuration is changed Android system destroys the instance of the activity that was running particular to that device configuration and it creates the new instance of the activity according to the new device configuration. Let us first try to understand it by writing some code and seeing our application behavior. So let us go back to our application and start coding.

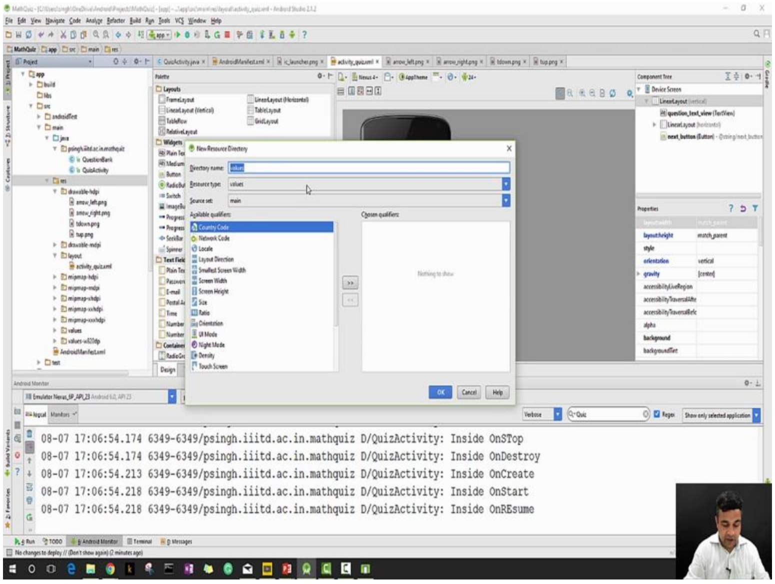
(Refer Slide Time: 3:29)



```
08-07 17:02:41.916 2351-2351/ps                                 ctivity: Inside OnStart
08-07 17:02:41.916 2351-2351/ps                                 ctivity: Inside OnREsume
08-07 17:06:38.558 6349-6349/ps                                 ctivity: Inside OnCreate
08-07 17:06:38.617 6349-6349/ps                                 ctivity: Inside OnStart
08-07 17:06:38.617 6349-6349/psingh.iiitd.ac.in.mathquiz D/QuizActivity: Inside OnREsume
```

As you see our application is here. When I run the application display is a question. I can go to next now I come to 43. I rotate and again I get the first question which was (())(3:35). So this was happening and today we will that see once I move ahead I do not come back to the first question. Now let us see let us also see the log, we will see create start resume, create start resume and you will see this destroy which occurred because we rotated our screen. Again we rotated and that is why again destroy occurred and then a new instance was created. This as you see, we can crack because we had overridden these methods with appropriate log messages.

(Refer Slide Time: 4:29)



New Resource Directory

Directory name: values

Resource type: values

Source set: main

Available qualifiers:

- Country Code
- Network Code
- Locale
- Layout Direction
- Smallest Screen Width
- Screen Width
- Screen Height
- Size
- Ratio
- Orientation
- UI Mode
- Night Mode
- Density
- Touch Screen

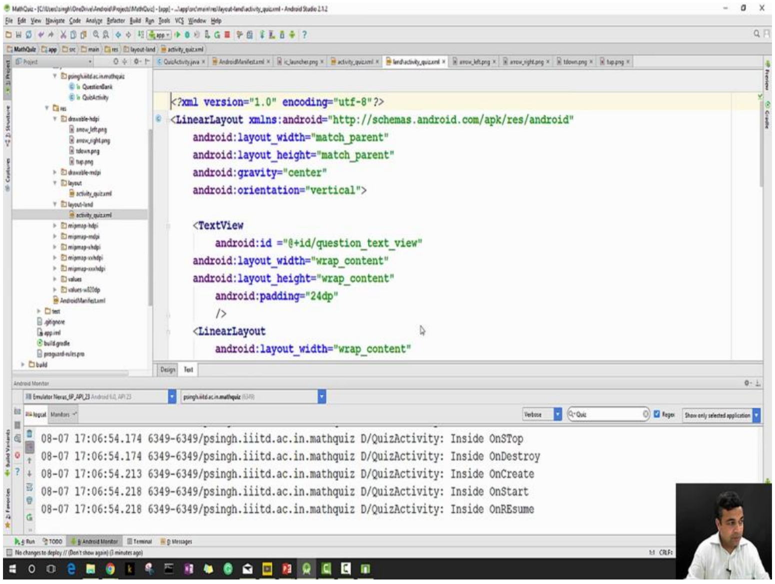
Chosen qualifiers:

Nothing to show

```
08-07 17:06:54.174 6349-6349/psingh.iiitd.ac.in.mathquiz D/QuizActivity: Inside OnSTop
08-07 17:06:54.174 6349-6349/psingh.iiitd.ac.in.mathquiz D/QuizActivity: Inside OnDestroy
08-07 17:06:54.213 6349-6349/psingh.iiitd.ac.in.mathquiz D/QuizActivity: Inside OnCreate
08-07 17:06:54.218 6349-6349/psingh.iiitd.ac.in.mathquiz D/QuizActivity: Inside OnStart
08-07 17:06:54.218 6349-6349/psingh.iiitd.ac.in.mathquiz D/QuizActivity: Inside OnREsume
```

Fine, now let us first talk about device configuration. So far we have only one configuration and that configuration is defined in this file called layout. I would now like to add another layout to my application. I can do that by going into res directory, right click new and from new I can see the various options are available to me and I can come to this thing called Android Resource Directory. Android Resource Directory shows me a dialog box. It says what is the directory name, I am going to call the directory name Layout and I am going to among the left hand options I am going to choose orientation. In the resource tab I choose layout, choose orientation and I select it. I will choose the screen orientation to be landscape and as you will see that the directory name changes from layout to layout dash land.

(Refer Slide Time: 6:21)

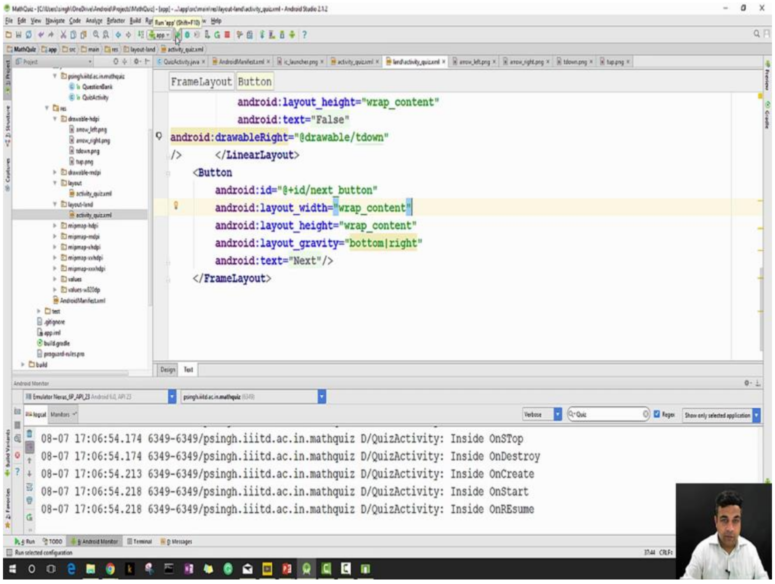


```
<?xml version="1.0" encoding="utf-8"?>
<LinearLayout xmlns:android="http://schemas.android.com/apk/res/android"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:gravity="center"
    android:orientation="vertical">

    <TextView
        android:id ="@+id/question_text_view"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
        android:padding="24dp"
        />
    <LinearLayout
        android:layout_width="wrap_content"
```

```
08-07 17:06:54.174 6349-6349/psingh.iiitd.ac.in.mathquiz D/QuizActivity: Inside OnSTop
08-07 17:06:54.174 6349-6349/psingh.iiitd.ac.in.mathquiz D/QuizActivity: Inside OnDestroy
08-07 17:06:54.213 6349-6349/psingh.iiitd.ac.in.mathquiz D/QuizActivity: Inside OnCreate
08-07 17:06:54.218 6349-6349/psingh.iiitd.ac.in.mathquiz D/QuizActivity: Inside OnStart
08-07 17:06:54.218 6349-6349/psingh.iiitd.ac.in.mathquiz D/QuizActivity: Inside OnREsume
```

Android does it to find out the correct layout as per the orientation of the device. Now, we have got a layout dash land directory but currently there is nothing in this directory. So what I am going to do is I am going to copy my activity quiz and go to XML into my layout dash land. I will keep the same name because I want to use the same resource ID, I copied it. Now if I (())(6:27) on the application there will be no change because for the both layouts I am using the same file. So let us make some changes in our new file so that we can see what happens when we rotate our screen.

(Refer Slide Time: 9:00)

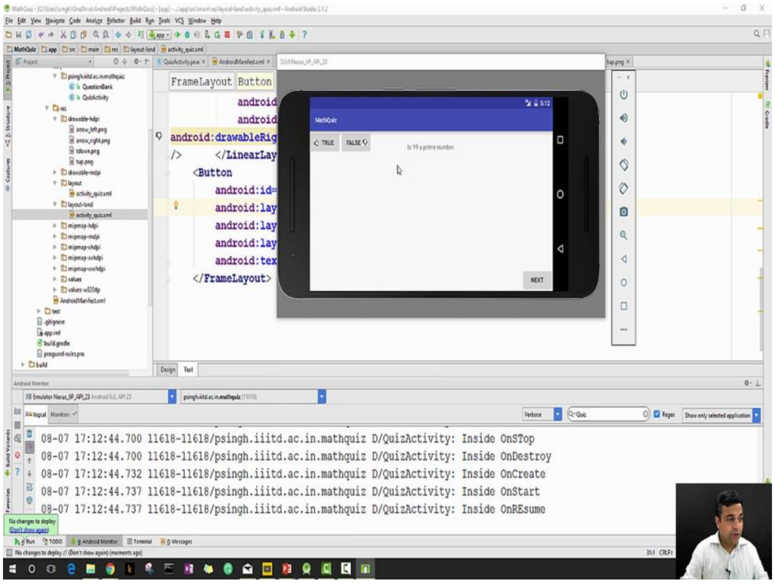


```
            android:layout_height="wrap_content"
            android:text="False"
android:drawableRight="@drawable/tdown"
/>      </LinearLayout>
    <Button
        android:id="@+id/next_button"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_gravity="bottom|right"
        android:text="Next"/>
    </FrameLayout>
```

```
08-07 17:06:54.174 6349-6349/psingh.iiitd.ac.in.mathquiz D/QuizActivity: Inside OnSTop
08-07 17:06:54.174 6349-6349/psingh.iiitd.ac.in.mathquiz D/QuizActivity: Inside OnDestroy
08-07 17:06:54.213 6349-6349/psingh.iiitd.ac.in.mathquiz D/QuizActivity: Inside OnCreate
08-07 17:06:54.218 6349-6349/psingh.iiitd.ac.in.mathquiz D/QuizActivity: Inside OnStart
08-07 17:06:54.218 6349-6349/psingh.iiitd.ac.in.mathquiz D/QuizActivity: Inside OnREsume
```

The first I am going to change is to change the linear layout to something called as frame layout. Let me type frame layout cut linear layout altogether and read it leave it to match parent match parent and I do not really need these two fields, keep saving my activity underscore quiz under the layout dash land directory. Then the next thing that we are going to do is to make some changes to the gravity parameter of the text (())(7:35). So let us add Android layout gravity and I will call it center horizontal. Ok that is done. After that I will move and I will change the location of my buttons a little bit. So I have 2 buttons and I am going to change their locations of let us say one button. For the next I should go I should say Android layout gravity bottom right, I saved, let me run my application.

(Refer Slide Time: 9:25)

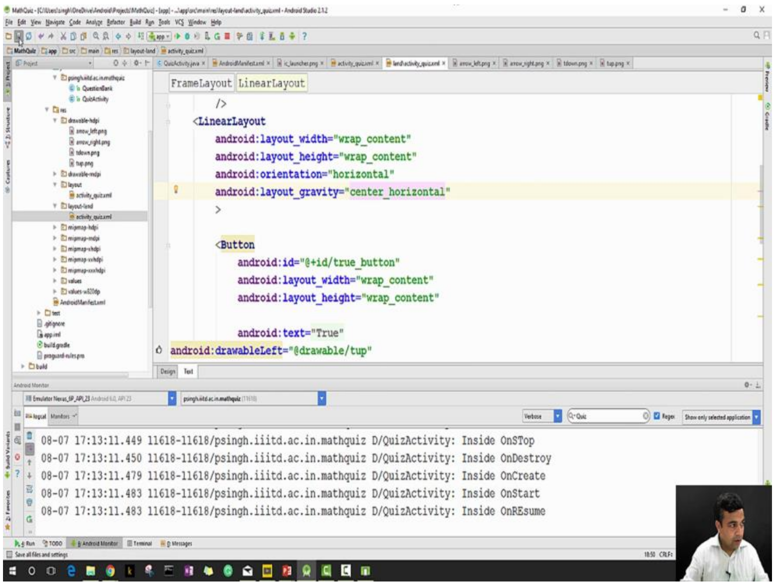


```
FrameLayout  Button
                android
                android
android:drawableRig
/>          </LinearLay
        <Button
            android:id=
            android:lay
            android:lay
            android:lay
            android:tex
        </FrameLayout>
```

```
08-07 17:12:44.700 11618-11618/psingh.iiitd.ac.in.mathquiz D/QuizActivity: Inside OnSTop
08-07 17:12:44.700 11618-11618/psingh.iiitd.ac.in.mathquiz D/QuizActivity: Inside OnDestroy
08-07 17:12:44.732 11618-11618/psingh.iiitd.ac.in.mathquiz D/QuizActivity: Inside OnCreate
08-07 17:12:44.737 11618-11618/psingh.iiitd.ac.in.mathquiz D/QuizActivity: Inside OnStart
08-07 17:12:44.737 11618-11618/psingh.iiitd.ac.in.mathquiz D/QuizActivity: Inside OnREsume
```

My application is started and when it starts it is in the portrait mode we see the familiar layout. Let us rotate, Oh now you can see definitely some changes. For example my next button has gone into the bottom right corner and because I did not change the location of these two buttons they are still at the same place. Let me come back and one more time I get the familiar layout.

(Refer Slide Time: 10:45)



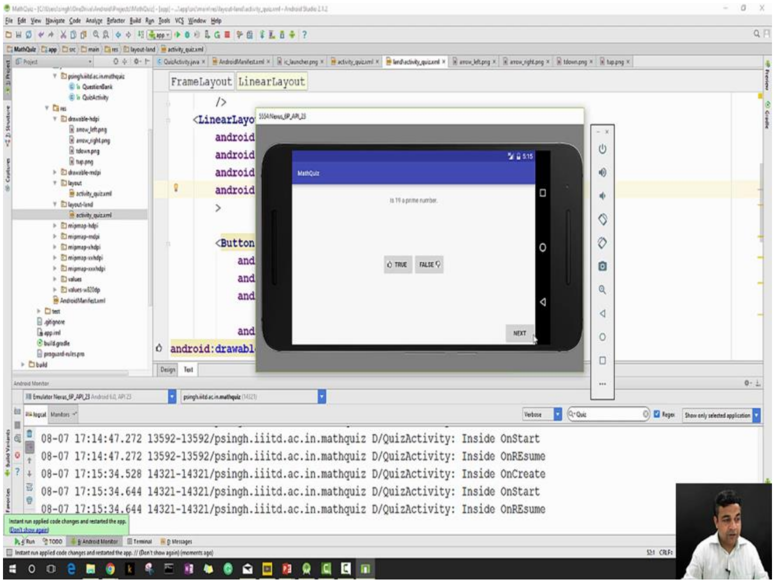
```
FrameLayout  LinearLayout
            />
        <LinearLayout
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:orientation="horizontal"
            android:layout_gravity="center_horizontal"
            >

            <Button
                android:id="@+id/true_button"
                android:layout_width="wrap_content"
                android:layout_height="wrap_content"

                android:text="True"
android:drawableLeft="@drawable/tup"
```

Design
Text
Emulator Nexus_6P_API_23 Android 6.0, API 23
psingh.iiitd.ac.in.mathquiz (11618)
logcat
Monitors
Verbose
Q-Quiz
Regex
Show only selected application
Run
TODO
Android Monitor
Terminal
Messages

```
08-07 17:13:11.449 11618-11618/psingh.iiitd.ac.in.mathquiz D/QuizActivity: Inside OnSTop
08-07 17:13:11.450 11618-11618/psingh.iiitd.ac.in.mathquiz D/QuizActivity: Inside OnDestroy
08-07 17:13:11.479 11618-11618/psingh.iiitd.ac.in.mathquiz D/QuizActivity: Inside OnCreate
08-07 17:13:11.483 11618-11618/psingh.iiitd.ac.in.mathquiz D/QuizActivity: Inside OnStart
08-07 17:13:11.483 11618-11618/psingh.iiitd.ac.in.mathquiz D/QuizActivity: Inside OnREsume
```

Now let me go to these two buttons and we want them to look alright. So I will do Android layout gravity and I may want to set them up somewhere in the center. I may want to set my linear layout in (())(10:31) to let us say center horizontal, I save I run my application. This is my application viewed at rotation. Oh, they have gone to the top. Let me try another configuration, I give it center of the vertical, stop and I start again hmm I will have to do slightly more planning than I was planning to do earlier. Let us make change one more time except that now I have come to the center vertical and now I also want it to be center horizontal. Yes let us run our application.

(Refer Slide Time: 12:13)

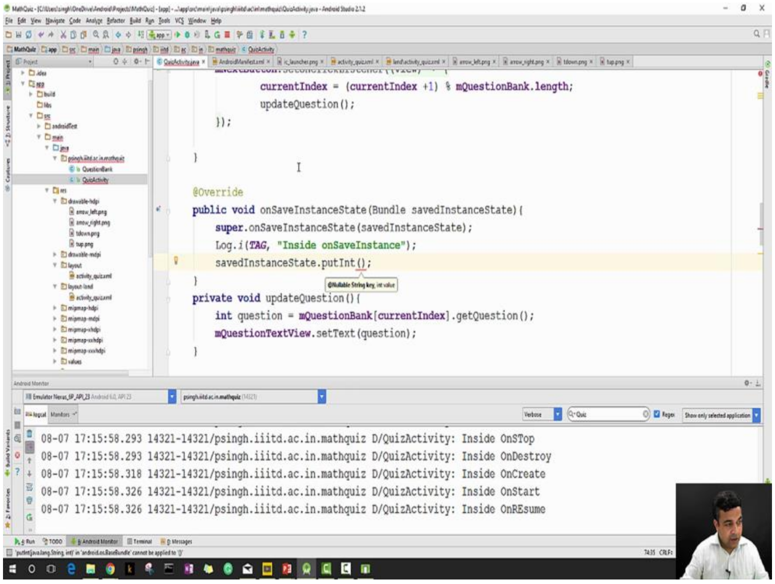


```
08-07 17:14:47.272 13592-13592/psingh.iiitd.ac.in.mathquiz D/QuizActivity: Inside OnStart
08-07 17:14:47.272 13592-13592/psingh.iiitd.ac.in.mathquiz D/QuizActivity: Inside OnREsume
08-07 17:15:34.528 14321-14321/psingh.iiitd.ac.in.mathquiz D/QuizActivity: Inside OnCreate
08-07 17:15:34.644 14321-14321/psingh.iiitd.ac.in.mathquiz D/QuizActivity: Inside OnStart
08-07 17:15:34.644 14321-14321/psingh.iiitd.ac.in.mathquiz D/QuizActivity: Inside OnREsume
```

Instant run applied code changes and restarted the app.

Wow, now our application looks good. It is asking the question it is showing the question showing the options and then it is showing the next button. Let me pass the next where I am going forward where there were 4 questions the second question I rotate it back. Oops, I am again back to the original question because we have so far we have not solved the problem. Now we are going to solve it and the way to solve it is to override on save instance state method, let us go back again to our code.

(Refer Slide Time: 12:55)



```
            currentIndex = (currentIndex +1) % mQuestionBank.length;
            updateQuestion();
        });

    }

    @Override
    public void onSaveInstanceState(Bundle savedInstanceState){
        super.onSaveInstanceState(savedInstanceState);
        Log.i(TAG, "Inside onSaveInstance");
        savedInstanceState.putInt();
    }
    private void updateQuestion(){
        int question = mQuestionBank[currentIndex].getQuestion();
        mQuestionTextView.setText(question);
    }
```

@Nullable String key, int value
Emulator Nexus_6P_API_23 Android 6.0, API 23
psingh.iiitd.ac.in.mathquiz (14321)
Verbose
Quiz
Regex
Show only selected application

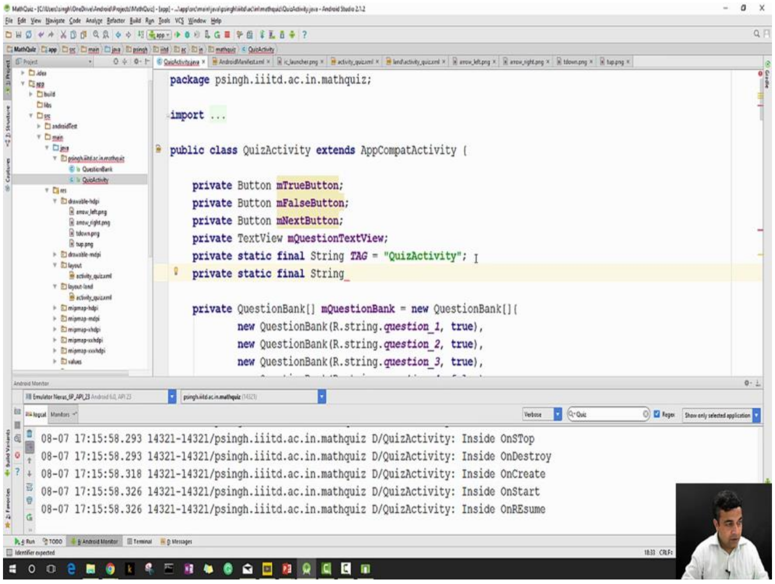
```
08-07 17:15:58.293 14321-14321/psingh.iiitd.ac.in.mathquiz D/QuizActivity: Inside OnSTop
08-07 17:15:58.293 14321-14321/psingh.iiitd.ac.in.mathquiz D/QuizActivity: Inside OnDestroy
08-07 17:15:58.318 14321-14321/psingh.iiitd.ac.in.mathquiz D/QuizActivity: Inside OnCreate
08-07 17:15:58.326 14321-14321/psingh.iiitd.ac.in.mathquiz D/QuizActivity: Inside OnStart
08-07 17:15:58.326 14321-14321/psingh.iiitd.ac.in.mathquiz D/QuizActivity: Inside OnREsume
```

'putInt(java.lang.String, int)' in 'android.os.BaseBundle' cannot be applied to '()'

Let us go to quiz activity. First try to understand what we were doing. So we had a variable called current index which was set to zero and when we were passing next button we were increasing current index by one and when we were updating question we were displaying the question which is set to the current index. Now because the current index always gets resets to zero we come back to our first question. So what we need to do is that when we rotate we need to save the current index value, so let us see how to do that. Ok we go we go go go and anywhere we can start but let me start just right here. I will again start with override because it will warn me if I am using a wrong method name, public void on save instance state bundle saved instance state that is it.

Oh so I was actually, so this is my parent on save instance and now overriding it. So what do I need to do to save our value of current index? Number one, the bundle saves the values as key value payers, so we will have to create a key value payer for our program. First and foremost let us just first call the super functions so that we do not end up into error then we should also put a log message. I am putting ‘I’ with info, my tag remains the same and I say inside on save instance. Now comes the main part of saving our current index value. We can save the current index value calling them under because our current index value is integer I would like to put an int. and as you see the put int method requires me to give a key and a value, let us save the key.

(Refer Slide Time: 16:56)

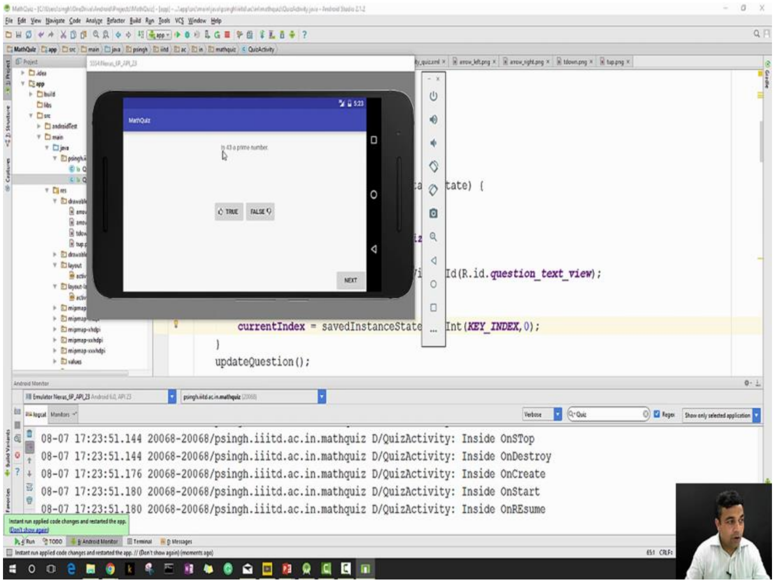


```
package psingh.iiitd.ac.in.mathquiz;

import ...

public class QuizActivity extends AppCompatActivity {

    private Button mTrueButton;
    private Button mFalseButton;
    private Button mNextButton;
    private TextView mQuestionTextView;
    private static final String TAG = "QuizActivity";
    private static final String_

    private QuestionBank[] mQuestionBank = new QuestionBank[]{
            new QuestionBank(R.string.question_1, true),
            new QuestionBank(R.string.question_2, true),
            new QuestionBank(R.string.question_3, true),
```

```
08-07 17:15:58.293 14321-14321/psingh.iiitd.ac.in.mathquiz D/QuizActivity: Inside OnSTop
08-07 17:15:58.293 14321-14321/psingh.iiitd.ac.in.mathquiz D/QuizActivity: Inside OnDestroy
08-07 17:15:58.318 14321-14321/psingh.iiitd.ac.in.mathquiz D/QuizActivity: Inside OnCreate
08-07 17:15:58.326 14321-14321/psingh.iiitd.ac.in.mathquiz D/QuizActivity: Inside OnStart
08-07 17:15:58.326 14321-14321/psingh.iiitd.ac.in.mathquiz D/QuizActivity: Inside OnREsume
```

For the key I will go up here and I will create private static final string let me call it key index key index and give it the value index. Come down to my function, I put key index and for the value I will put current index. This would save the value of the current index whenever we want to change our screen by rotating it. Now let us make appropriate changes in our program so that we can work with. The number one thing that we have to do is to check our saved instance is not null, because we are using our saved instance here we must make a check on this, come down just before updating the question I will say if saved instance state is not equal to null then set my current index equal to saved instance state.get int corresponding to key index and the differed value is zero and that is it, so we saved the value and we retrieved the value.

(Refer Slide Time: 19:28)



```
                                               tate) {
                                               Id(R.id.question_text_view);
        currentIndex = savedInstanceState      Int(KEY_INDEX,0);
    }
    updateQuestion();
```

```
08-07 17:23:51.144 20068-20068/psingh.iiitd.ac.in.mathquiz D/QuizActivity: Inside OnSTop
08-07 17:23:51.144 20068-20068/psingh.iiitd.ac.in.mathquiz D/QuizActivity: Inside OnDestroy
08-07 17:23:51.176 20068-20068/psingh.iiitd.ac.in.mathquiz D/QuizActivity: Inside OnCreate
08-07 17:23:51.180 20068-20068/psingh.iiitd.ac.in.mathquiz D/QuizActivity: Inside OnStart
08-07 17:23:51.180 20068-20068/psingh.iiitd.ac.in.mathquiz D/QuizActivity: Inside OnREsume
```

Instant run applied code changes and restarted the app.

Now let us run our application and see if it works. We will also be watching the log messages. Let me go to the third question and now I will rotate. Wow, this time we did not get the error and we can see that on save instance was good. This is it so far, now you can very safely develop Android applications which use only a single activity. In the next lecture you will improve our app and will start adding more activities to it. In the next lecture I will tell you how to create apps which uses more than one activity Thank you.