

Spring 2016 (Wednesday, March 23)

Name: _____

CS 4330: Mobile Application Development

Exam 1

This test has 9 questions and pages numbered 1 through 9.

Reminders

This test is open-book. In addition to a hardcopy textbook, you may also bring 1 page (8.5 X 11) of double-sided notes. Your notes must be your own, they must be hand written, and they must be turned in with your test.

This test is to be done individually, and you are not to exchange or share materials such as the textbook and notes with other students during the test.

If you need more space, use the back of a page. Note when you do that on the front.

This test is timed. Your test will not be graded if you try to take more than the time allowed. Therefore, before you begin, please take a moment to look over the entire test so that you can budget your time.

For program code, clarity is important; if your writings or code are sloppy and hard to read, you will lose points. Correct syntax also makes some difference.

There are 110 points all, including 10 bonus points.

1. (total 20 points) Short answers

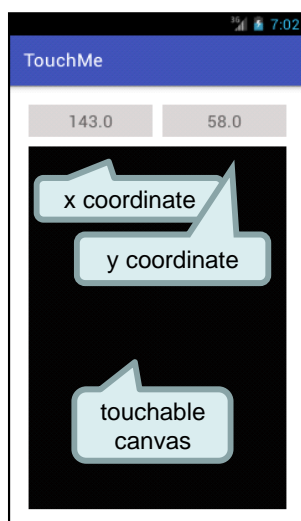
- (a) (2 points) All Android apps have an automatically generated file named _____. `java`. It provides references (or resource Ids) to various resources used by the applications, e.g., strings, drawables/mipmaps, layouts and styles. That is, instead of hard coding such resources into an application, one externalizes and refers them by Ids.
- (b) (2 points) A special view class named `android.view._____` can contain one or more other views. It is a base class of all layout views and provides the layout in which the contained views can appear and be ordered.
- (c) (2 points) This layout class is used for simple arrangements that require elements to be displayed along either a horizontal or vertical line. Which layout class is described?
 - i. `FrameLayout`
 - ii. `GridLayout`
 - iii. `LinearLayout`
 - iv. `RelativeLayout`
- (d) (2 points) If you want to provide a special layout for landscape mode, you create a new layout folder named _____. The layout files contained within this folder define the UI of your app in the landscape mode.

- (e) (2 points) The term _____ design refers to the adaptation of a layout design that fits an individual screen size and/or orientation. It is important to Android because it supports flexibility when designing an app that can work on multiple devices.
- (f) (2 points) There are several framework methods to be called on various stages of an activity from its creation to destruction. This is the framework method where you initialize your activity. In this method you usually call the `setContentView()` method to set the UI of your application.
- i. `onCreate()`
 - ii. `onStart()`
 - iii. `onRestart()`
 - iv. `onResume`
- (g) (2 points) In general, you use the `startActivity()` framework method to invoke an activity. However, it doesn't return a result from the called activity to the calling activity. If you need to pass data back from the called activity, you should instead use the _____() method to invoke it.
- (h) (2 points) As stated in the previous question, an activity can indicate its intention to receive a result when invoking another activity. However, to actually receive data from the called activity, you override the _____() method in the calling activity class.
- (i) (2 points) To create a fragment, you must create a subclass of `android.app.Fragment` or an existing subclass of it, and then you have to override the following framework method to provide a layout (UI) for the fragment.
- i. `onAttach()`
 - ii. `onCreate()`
 - iii. `onCreateView()`
 - iv. `onActivityCreated()`
- (j) (2 points) Android provides three different types of menus: *options*, *context* and *popup*. Mark all the statements that are NOT applicable to a context menu.
- i. It displays information related to the current activity.
 - ii. It displays information related to a particular view of an activity.
 - iii. It is a floating menu owned by or associated with a view.
 - iv. Menu items can be defined statically in an XML resource file or programmatically in source code.
 - v. It is created by overriding the `onCreateContextMenu()` method in an activity.
 - vi. It can be activated by any UI event such as button click.

6. (total 25 points) You are to write an app named *TouchMe* that displays the x- and y-coordinate of the last touched position in the screen.

- (a) (10 points) Configure the UI by completing the layout file, `activity_main.xml`, on the next page. The UI consists of three views: two views at the top for displaying x- and y-coordinates and a view at the bottom for touching the screen. The views for x- and y-coordinates have equal widths and they together fill the width of their parent view. Do not worry about the background colors of the views.

If needed, skeletal code of the main activity class is found on page 6.



Use the following custom view class named `CanvasView` for the bottom view, i.e., for touching the screen.

```
package edu.utep.cs.cs4330.touchme;

import android.content.Context;
import android.util.AttributeSet;

public class CanvasView extends View {

    public CanvasView(Context ctx, AttributeSet attrs) {
        super(ctx, attrs);
    }
}
```

```
<?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:orientation="vertical"
    tools:context="edu.utep.cs.cs4330.touchme.MainActivity">
    <!-- YOUR ANSWER HERE! -->
```

```
</LinearLayout>
```

- (b) (15 points) Complete the skeletal code of the main activity class given below by providing missing code numbered 1, 2 and 3. Hint: If you write more than a few lines for each missing code, you are doing it in a hard way.

```

package edu.utep.cs.cs4330.touchme;

import ...; // do not worry about importing classes

public class MainActivity extends AppCompatActivity {
    private CanvasView canvasView;

    //— 1. YOUR FIELD DECLARATIONS HERE, IF ANY.

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

        // find the canvas view and register an onTouchListener
        canvasView = (CanvasView) findViewById(R.id.canvasView);
        canvasView.setOnTouchListener(new View.OnTouchListener() {
            public boolean onTouch(View v, MotionEvent event) {
                if (event.getAction() == MotionEvent.ACTION_DOWN)
                    screenTouched(event.getX(), event.getY());
                return false;
            }
        });

    //— 2. THE REST OF CODE FOR ONCREATE METHOD HERE.

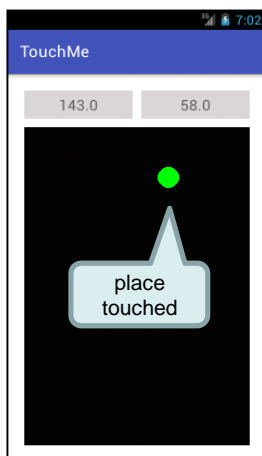
    }

    /** Called when the screen is touched at position x and y. */
    protected void screenTouched(float x, float y) {
        //— 3. YOUR CODE HERE.

    }
}

```

7. (10 points) Improve the TouchMe app to draw a dot at the position where the screen is touched.

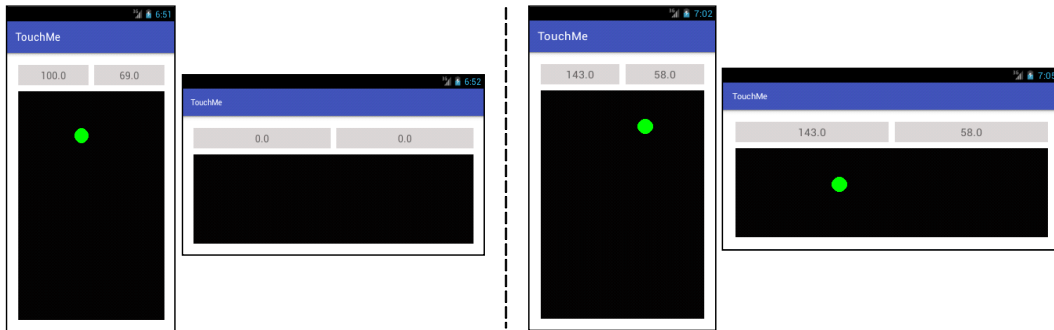


One way to accomplish this is:

- To add a couple of statements to the `screenTouched()` method of the MainActivity class to let the canvas view know the coordinates of the last touched position.
- To modify the CanvasView class to store the last touched position and to draw a circle at the position as well.

Write your additional code or modifications to the existing code below.

8. (20 points) You are to improve the TouchMe app again to handle screen orientation changes. The screenshots below show the behavior of the app, when the screen orientation of the device is changed from portrait to landscape, before (left) and after (right) your improvement.



- (a) (6 points) When the screen orientation is changed from portrait to landscape, the coordinates of the last touched position are not shown correctly and the dot on the canvas view disappears as well. Explain the reason by relating to the activity lifecycle; be specific about the sequence of lifecycle methods called upon screen orientation changes.
- (b) (4 points) Name the two methods that you override to handle configuration changes of an activity such as screen orientation changes.
- (c) (8 points) Write the two methods you specified above to handle screen orientation changes correctly by displaying the the coordinates of the last touched position and drawing a circle at it. Use the `float Float.valueOf(String)` static method to convert a string to a float, which may throw an unchecked exception, `NumberFormatException`.

9. (10 bonus points) Improve the TouchMe app to provide a landscape mode-specific UI such as the one shown below. What changes do you have to make to your existing code or resource files? Sketch the UI and specify the the name and location of your new layout file.

