Grow with Google Challenge Scholarship
Lesson 10 Notes

Which Match - Solution

Given the following code:

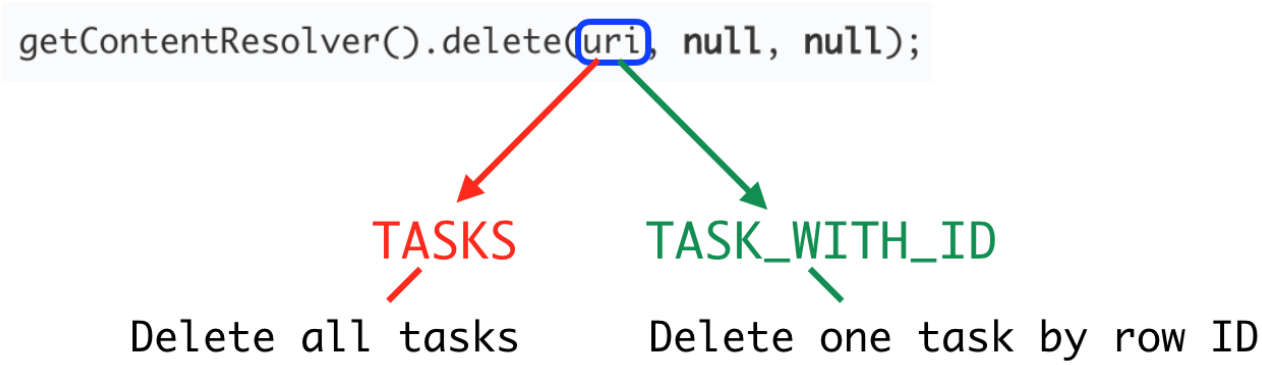
```
int id = 4;
String idString = "" + id;
Uri uri = TaskContract.ItemEntry.CONTENT_URI;
uri = uri.buildUpon().appendPath(idString).build();
getContentResolver().delete(uri, null, null);
```

The constructed URI will be: `content://com.example.android.todolist/tasks/4`. The URIMatcher will recognize this URI as identifying a single row in the tasks database with a row id = 4, so it will match it to the **TASK_WITH_ID** integer constant, which is the correct answer. Without this appended ID, this would match with the **TASKS** constant.

Next, let's go through the details of the delete function call via a ContentResolver.

```
getContentResolver().delete(uri, null, null);
```

This delete call will get to our TaskContentProvider and then the UriMatcher will match the passed in URI to the TASK_WITH_ID integer constant. This is important for the delete method because the ContentProvider needs to be able to identify and delete just *the one row* with ID = 4. It shouldn't delete *the entire directory* of tasks.

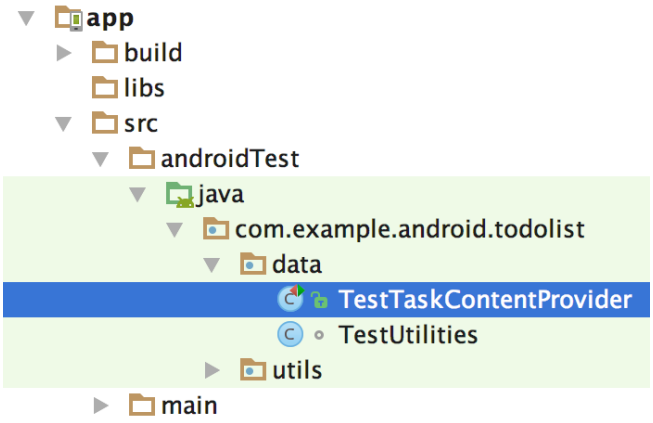


Example of different delete behavior depending on the recognized URI.

So, when a ContentProvider works with multiple types of data and corresponding URI's, a UriMatcher plays an important role in accurate data management.

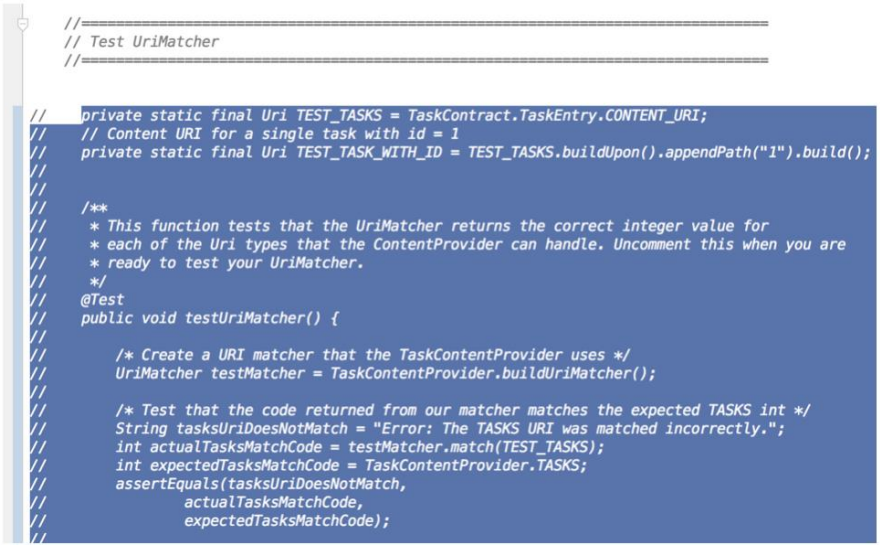
A Small Note on Testing

In lesson the Storing Data in SQLite lesson, you were introduced to the idea of **unit tests** that let you test whether a small piece of code works as you expected.
In the exercises for this lesson, you've been provided with unit tests that test the functionality of your `TaskContentProvider`. There are tests for the individual functions you'll implement (like `insert` and `delete`) as well as tests to see if you've registered the `ContentProvider` correctly and if your `UriMatcher` is working as it should.
All of these tests are kept in the **src** > **androidTest** folder in the `TestTaskContentProvider` class.

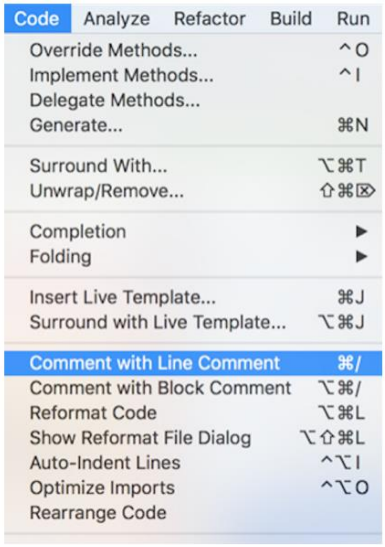


Location of TestTaskContentProvider.

To enable a test for a certain function, just uncomment that particular test by highlighting the text and selecting *Code > Comment with Line Comment*, as in the image below.
Note: If you uncomment some text code, and received some red lines indicating errors, you likely have to import some classes to complete the test code.



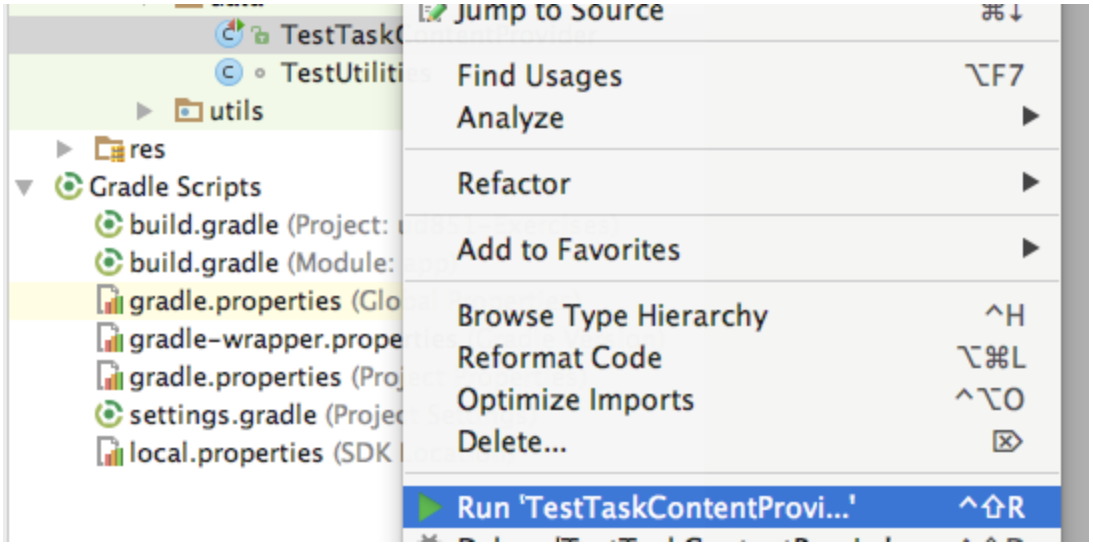
```
//==========================================================================
// Test UriMatcher
//==========================================================================


//    private static final Uri TEST_TASKS = TaskContract.TaskEntry.CONTENT_URI;
//    // Content URI for a single task with id = 1
//    private static final Uri TEST_TASK_WITH_ID = TEST_TASKS.buildUpon().appendPath("1").build();
//
//
//    /**
//     * This function tests that the UriMatcher returns the correct integer value for
//     * each of the Uri types that the ContentProvider can handle. Uncomment this when you are
//     * ready to test your UriMatcher.
//     */
//    @Test
//    public void testUriMatcher() {
//
//        /* Create a URI matcher that the TaskContentProvider uses */
//        UriMatcher testMatcher = TaskContentProvider.buildUriMatcher();
//
//        /* Test that the code returned from our matcher matches the expected TASKS int */
//        String tasksUriDoesNotMatch = "Error: The TASKS URI was matched incorrectly.";
//        int actualTasksMatchCode = testMatcher.match(TEST_TASKS);
//        int expectedTasksMatchCode = TaskContentProvider.TASKS;
//        assertEquals(tasksUriDoesNotMatch,
//                actualTasksMatchCode,
//                expectedTasksMatchCode);
//
```



(Left) Highlight desired test code. (Right) Uncomment the test you want to run.

To Run a Test

To run all the tests in a class, right click on the class name of the test and select **Run <TestClassName>** as seen below:



What Does the CustomCursorAdapter do?

The `CustomCursorAdapter` will inflate views using the xml layout file `task_layout`, and create `ViewHolders`that will fill the main `RecyclerView`.

Each `ViewHolder` includes data about a single task: it's text description and priority level. The `priorityView`will actually be a small colored circle that indicates the priority level 1-3 (1 is high and 3 is low).

The priority circle is a drawable resource, and its color is assigned to red, yellow, or green based on the priority level.

All of this code was included in your starter code, so no need to change anything in here.

Query for One Item

Here's the code for querying a single task:

```
    // Implement query to handle requests for data by URI
    @Override
    public Cursor query(@NonNull Uri uri, String[] projection, String selection,
            String[] selectionArgs, String sortOrder) {

        // Get access to underlying database (read-only for query)
        final SQLiteDatabase db = mTaskDbHelper.getReadableDatabase();

        // Write URI match code
        // Write a query for the tasks directory and default case

        int match = sUriMatcher.match(uri);
        Cursor retCursor;

        switch (match) {
            // Query for the tasks directory
            case TASKS:
                retCursor =  db.query(TABLE_NAME,
                        projection,
                        selection,
                        selectionArgs,
                        null,
                        null,
                        sortOrder);
                break;

            // Add a case to query for a single row of data by ID
            // Use selections and selectionArgs to filter for that ID
            case TASK_WITH_ID:
                // Get the id from the URI
                String id = uri.getPathSegments().get(1);

                // Selection is the _ID column = ?, and the Selection args = the row ID from the URI
                String mSelection = "_id=?";
                String[] mSelectionArgs = new String[]{id};

                // Construct a query as you would normally, passing in the selection/args
                retCursor =  db.query(TABLE_NAME,
                        projection,
                        mSelection,
                        mSelectionArgs,
                        null,
                        null,
                        sortOrder);
                break;

            // Default exception
            default:
```

```
                throw new UnsupportedOperationException("Unknown uri: " + uri);
        }

        // Set a notification URI on the Cursor
        retCursor.setNotificationUri(getContext().getContentResolver(), uri);

        // Return the desired Cursor
        return retCursor;
    }
```

Update

The sample code for `update` is below. We won't be using this functionality in this app, but if you plan to provide your app's data to other applications, you should implement all of the operations that you want developers to be able to use.

```
    // Update won't be used in the final ToDoList app but is implemented here for completeness
    // This updates a single item (by it's ID) in the tasks directory
    @Override
    public int update(@NonNull Uri uri, ContentValues values, String selection,
            String[] selectionArgs) {

        //Keep track of if an update occurs
        int tasksUpdated;

        // match code
        int match = sUriMatcher.match(uri);

        switch (match) {
            case TASK_WITH_ID:
                //update a single task by getting the id
                String id = uri.getPathSegments().get(1);
                //using selections
                tasksUpdated = mTaskDbHelper.getWritableDatabase().update(TABLE_NAME,
values, "_id=?", new String[]{id});
                break;
            default:
                throw new UnsupportedOperationException("Unknown uri: " + uri);
        }

        if (tasksUpdated != 0) {
            //set notifications if a task was updated
            getContext().getContentResolver().notifyChange(uri, null);
        }

        // return number of tasks updated
        return tasksUpdated;
    }
```

GetType

Here's an example of getType for the ToDo list app:

```
/* getType() handles requests for the MIME type of data
We are working with two types of data:
1) a directory and 2) a single row of data.
This method will not be used in our app, but gives a way to standardize the data formats
that your provider accesses, and this can be useful for data organization.
For now, this method will not be used but will be provided for completeness.
 */
@Override
public String getType(@NonNull Uri uri) {
    int match = sUriMatcher.match(uri);

    switch (match) {
        case TASKS:
            // directory
            return "vnd.android.cursor.dir" + "/" + TaskContract.AUTHORITY + "/" + TaskContr
act.PATH_TASKS;
        case TASK_WITH_ID:
            // single item type
            return "vnd.android.cursor.item" + "/" + TaskContract.AUTHORITY + "/" + TaskCon
tract.PATH_TASKS;
        default:
            throw new UnsupportedOperationException("Unknown uri: " + uri);
    }
}
```

Setup Sunshine's Content Provider and Query Solution

In this exercise you modified the `WeatherProvider` class so that it could perform a query. This required registering the content provider in the `AndroidManifest.xml`, creating a URIMatcher and finally completing the query.

Notes on Solution Code

Add the Content Provider to the Manifest

First, we add the content provider to the manifest, using a provider tag:

```
<provider
  android:name=".data.WeatherProvider"
  android:authorities="@string/content_authority"
  android:exported="false"/>
```

Setup the URIMatcher

It's important to note that a lot of code was provided for you. The `WeatherContract` was updated to include the new URIs you needed for this exercise, namely:

- **content://com.example.android.sunshine/weather/** - The directory of all weather data. This is the same as the `CONTENT_URI` for the weather table..
- **content://com.example.android.sunshine/weather/#** - A single item of data. The number here is meant to match a **date**. For these URIs the `WeatherProvider` includes the **buildWeatherUriWithDate**method.

The `URIMatcher` should be set up in such a way that it matches and maps these two types of URI to integer constants.
So first things first, you need to define two integer constants:

```
public static final int CODE_WEATHER = 100;
public static final int CODE_WEATHER_WITH_DATE = 101;
```

After this you should write a static method to build the URI matcher.

```
public static UriMatcher buildUriMatcher() {
    final UriMatcher matcher = new UriMatcher(UriMatcher.NO_MATCH);
    final String authority = WeatherContract.CONTENT_AUTHORITY;
    matcher.addURI(authority, WeatherContract.PATH_WEATHER, CODE_WEATHER);
    matcher.addURI(authority, WeatherContract.PATH_WEATHER + "/#", CODE_WEATHER_WITH_
DATE);
    return matcher;
}
```

Initialize the Content Provider

In this case because the underlying data structure is a SQLite database, you need to make a connection to that database in the `onCreate` method:

```
mOpenHelper = new WeatherDbHelper(getContext());
```

Code Query

To code query, you'll need to use your URI matcher to take the incoming URI and figure out what it is

```
public Cursor query(@NonNull Uri uri, String[] projection, String selection,
            String[] selectionArgs, String sortOrder) {
        Cursor cursor;
        switch (sUriMatcher.match(uri)) {

            case CODE_WEATHER_WITH_DATE: {
                // Code for querying with a date
                break;
            }
            case CODE_WEATHER: {
                // Code for querying the weather table
                break;
            }
            default:
                throw new UnsupportedOperationException("Unknown uri: " + uri);
        }
        cursor.setNotificationUri(getContext().getContentResolver(), uri);
        return cursor;
    }
```

The simpler of the two cases is querying the entire directory of weather, seen below:

```
cursor = mOpenHelper.getReadableDatabase().query(
                    WeatherContract.WeatherEntry.TABLE_NAME,
                    projection,
                    selection,
                    selectionArgs,
                    null,
                    null,
                    sortOrder);
```

When you're querying with a date, you can use getLastPathSegment to get the date string, then pass it in as a selection argument. The selection parameter should reference the date column, as seen below:

```
String normalizedUtcDateString = uri.getLastPathSegment();

String[] selectionArguments = new String[]{normalizedUtcDateString};

cursor = mOpenHelper.getReadableDatabase().query(
        /* Table we are going to query */
        WeatherContract.WeatherEntry.TABLE_NAME,
        projection,
        WeatherContract.WeatherEntry.COLUMN_DATE + " = ?",
        selectionArguments,
        null,
        null,
        sortOrder);
```

```
break;
```

Finally, it's important to set the notification URI for the cursor. We'll use this later when we implement a class called the CursorLoader.

```
cursor.setNotificationUri(getContext().getContentResolver(), uri);
```

See the full list of edits in the solution diff below.

Solution Code

Solution: [S09.01-Solution-ContentProviderFoundation][Diff]

Add Delete Functionality Solution

In this exercise you implemented the code to delete an entire database worth of weather data. Wow!

Notes on Solution Code

Note that in the solution code, you only need to implementing delete for the **CODE_WEATHER** case because you're deleting the entire database. You also don't have to actually use this delete functionality in the app, so it's up to you to run the tests and make sure everything was completed correctly. With that said, here's the code for delete:

```
@Override
public int delete(@NonNull Uri uri, String selection, String[] selectionArgs) {
    int numRowsDeleted;
    if (null == selection) selection = "1";
    switch (sUriMatcher.match(uri)) {
        case CODE_WEATHER:
            numRowsDeleted = mOpenHelper.getWritableDatabase().delete(
                    WeatherContract.WeatherEntry.TABLE_NAME,
                    selection,
                    selectionArgs);
            break;
        default:
            throw new UnsupportedOperationException("Unknown uri: " + uri);
    }

    if (numRowsDeleted != 0) {
        getContext().getContentResolver().notifyChange(uri, null);
    }
    return numRowsDeleted;
}
```

Solution Code

Solution: [S09.03-Solution-ContentProviderDelete][Diff]

Using a CursorLoader Solution

In this exercise you replaced the AsyncTaskLoader with a CursorLoader that gets data from the ContentProvider. Great job!!

Notes on Solution Code

One of the biggest changes to the Sunshine code was to update the ForecastAdapter and change its onBindViewHolder method so that it takes all of the data from a cursor and uses that to populate the views.

The final implementation of onBindViewHolder should look like this:

```
    @Override
    public void onBindViewHolder(ForecastAdapterViewHolder forecastAdapterViewHolder, int position
) {

        // Move the cursor to the appropriate position
        mCursor.moveToPosition(position);

        // Generate a weather summary with the date, description, high and low
        /* Read date from the cursor */
        long dateInMillis = mCursor.getLong(MainActivity.INDEX_WEATHER_DATE);
        /* Get human readable string using our utility method */
        String dateString = SunshineDateUtils.getFriendlyDateString(mContext, dateInM
illis, false);
        /* Use the weatherId to obtain the proper description */
        int weatherId = mCursor.getInt(MainActivity.INDEX_WEATHER_CONDITION_ID);
        String description = SunshineWeatherUtils.getStringForWeatherCondition(mConte
xt, weatherId);
        /* Read high temperature from the cursor (in degrees celsius) */
        double highInCelsius = mCursor.getDouble(MainActivity.INDEX_WEATHER_MAX_TEMP)
;
        /* Read low temperature from the cursor (in degrees celsius) */
        double lowInCelsius = mCursor.getDouble(MainActivity.INDEX_WEATHER_MIN_TEMP);

        String highAndLowTemperature =
                SunshineWeatherUtils.formatHighLows(mContext, highInCelsius, lowInCel
sius);

        String weatherSummary = dateString + "-" + description + "-" + highAndLowTemp
erature;

       // Display the summary that you created above
        forecastAdapterViewHolder.weatherSummary.setText(weatherSummary);
    }
```

To view all the changes to the ForecastAdapter and the MainActivity loader code, see the solution and comparison code linked below.

Solution Code

Solution: [S09.04-Solution-UsingCursorLoader][Diff]

More Weather Details Solution

In this exercise, you've uses CursorLoaders to display more weather information in the Detail Layout.

Here's the solution code for the onCreateLoader:

```
@Override
 public Loader<Cursor> onCreateLoader(int loaderId, Bundle loaderArgs) {
      switch (loaderId) {
           case ID_DETAIL_LOADER:
                return new CursorLoader(this,
                           mUri,
                           WEATHER_DETAIL_PROJECTION,
                           null,
                           null,
                           null);
           default:
                throw new RuntimeException("Loader Not Implemented: " + loaderId);
      }
 }
```

`onLoadFinished` should start by checking if cursor has valid data:

```
boolean cursorHasValidData = false;
if (data != null && data.moveToFirst()) {
   /* We have valid data, continue on to bind the data to the UI */
   cursorHasValidData = true;
}
if (!cursorHasValidData) {
   /* No data to display, simply return and do nothing */
   return;
}
```

Then for each piece of weather information, retrieve it from the cursor and display it in the appropriate view. For example, the fist text view should the display the date as follows:

```
long localDateMidnightGmt = data.getLong(INDEX_WEATHER_DATE);
String dateText = SunshineDateUtils.getFriendlyDateString(this, localDateMidnightGmt,
true);
mDateView.setText(dateText);
```

To view all the changes to the ForecastAdapter, MainActivity and the new layout code, see the solution and comparison code linked below.

Solution Code

Solution: [S09.05-Solution-MoreDetails][Diff]