Congratulations! You passed!
Grade received 100%To pass 100% or higher

Activity overview

In previous lessons, you learned about the importance of being able to clean your data where it lives. When it comes to data stored in databases, that means using SQL quer
activity, you will create a custom dataset and table, import a .csv file, and use SQL queries to clean automobile data.
Review the following scenario. Then complete the step-by-step instructions.

Scenario

n this scenario, you are a data analyst working with a used car dealership startup venture. The investors want you to find out which cars are most popular with customers so th
nake sure to stock accordingly.
By the time you complete this activity, you will be able to clean data using SQL. This will enable you to process and analyze data in databases, which is a common task for data

Step-By-Step Instructions

Follow the instructions to complete each step of the activity. Then answer the questions at the end of the activity before going to the next course item.

Step 1: Access the Template

To get started, download the *automobile_data.csv* file. This is data from an external source that contains historical sales data on car prices and their features.

Click the link to the *automobile_data.csv* file to download it. Or you may download the .csv file directly from the attachments below.

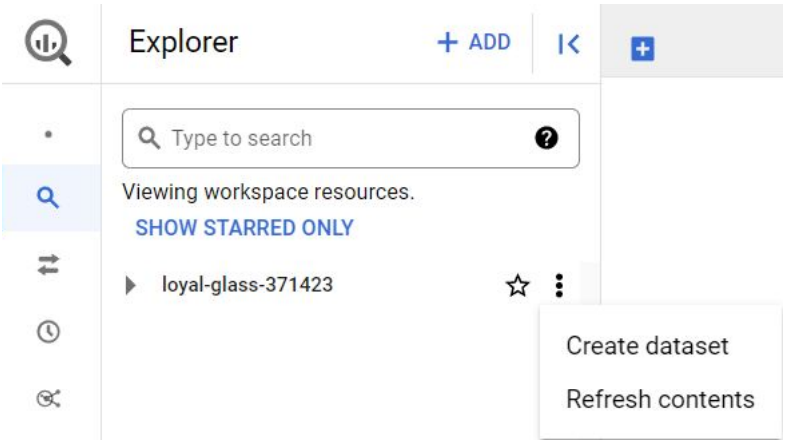
Link to data: automobile_data
OR

automobile_data
CSV File

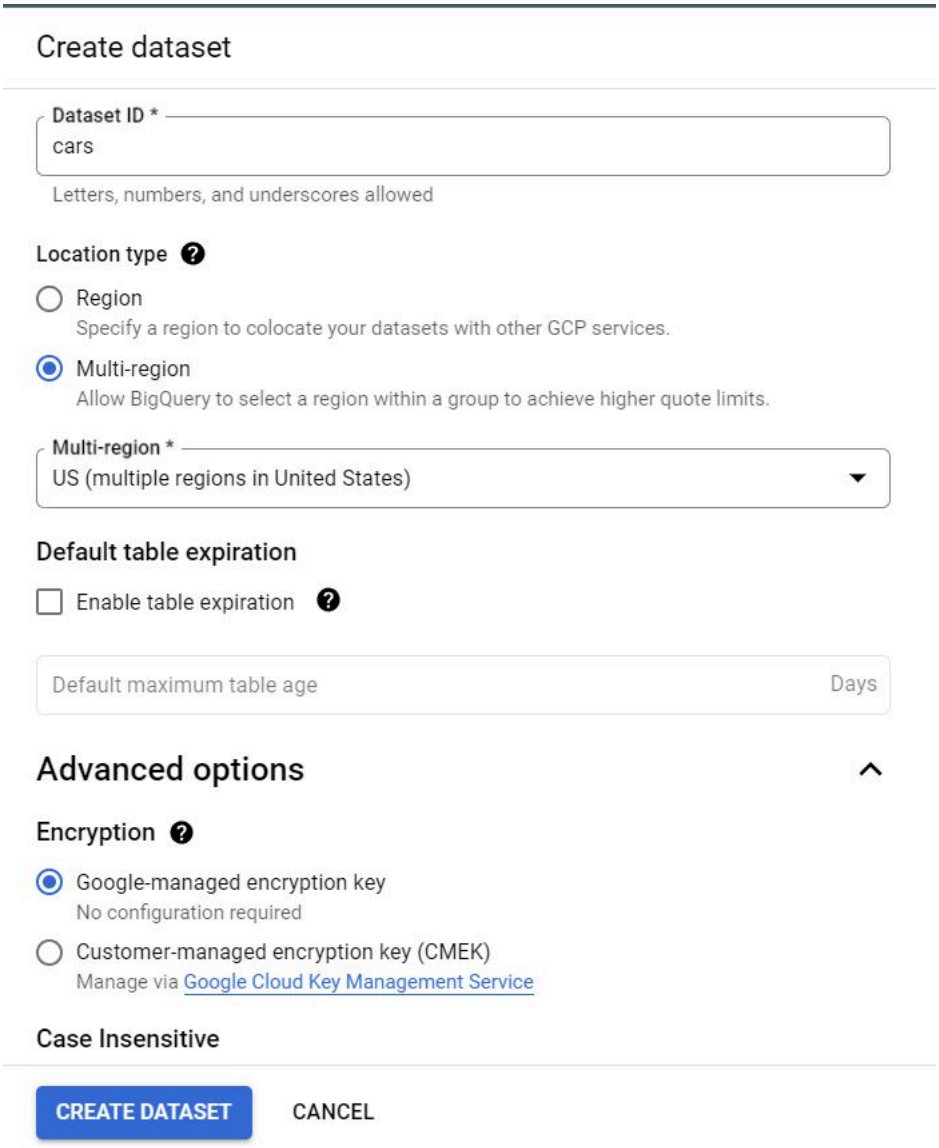
Step 2: Create a Dataset

Once you've downloaded the **`automobile_data.csv`** file, create your dataset.

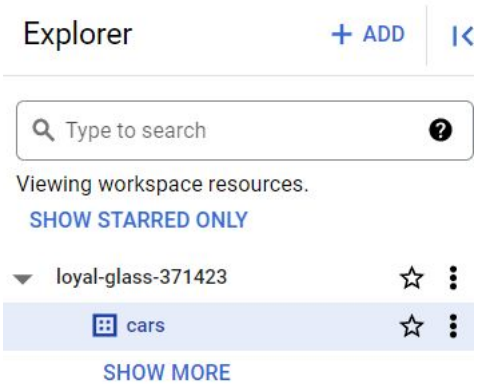
Go to the Explorer pane in your workspace and click the three dots next to your personal project name to open the drop-down menu. From here, select Create dataset.



From the Create dataset menu, fill out some information about the dataset. Input the Dataset ID as **`cars`** you can keep the Location type as Multi-region, US (multiple regions i
States), and the Encryption as Google-managed encryption key default settings. Then, click the CREATE DATASET button.



The `cars` dataset should appear under your project in the Explorer pane as shown below.

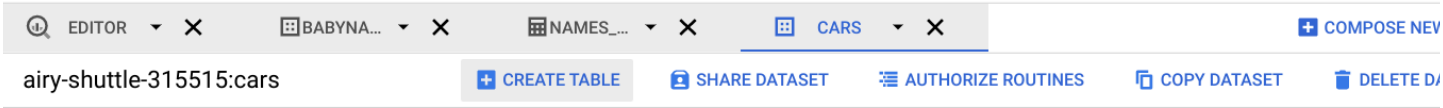


Step 3: Create a Table

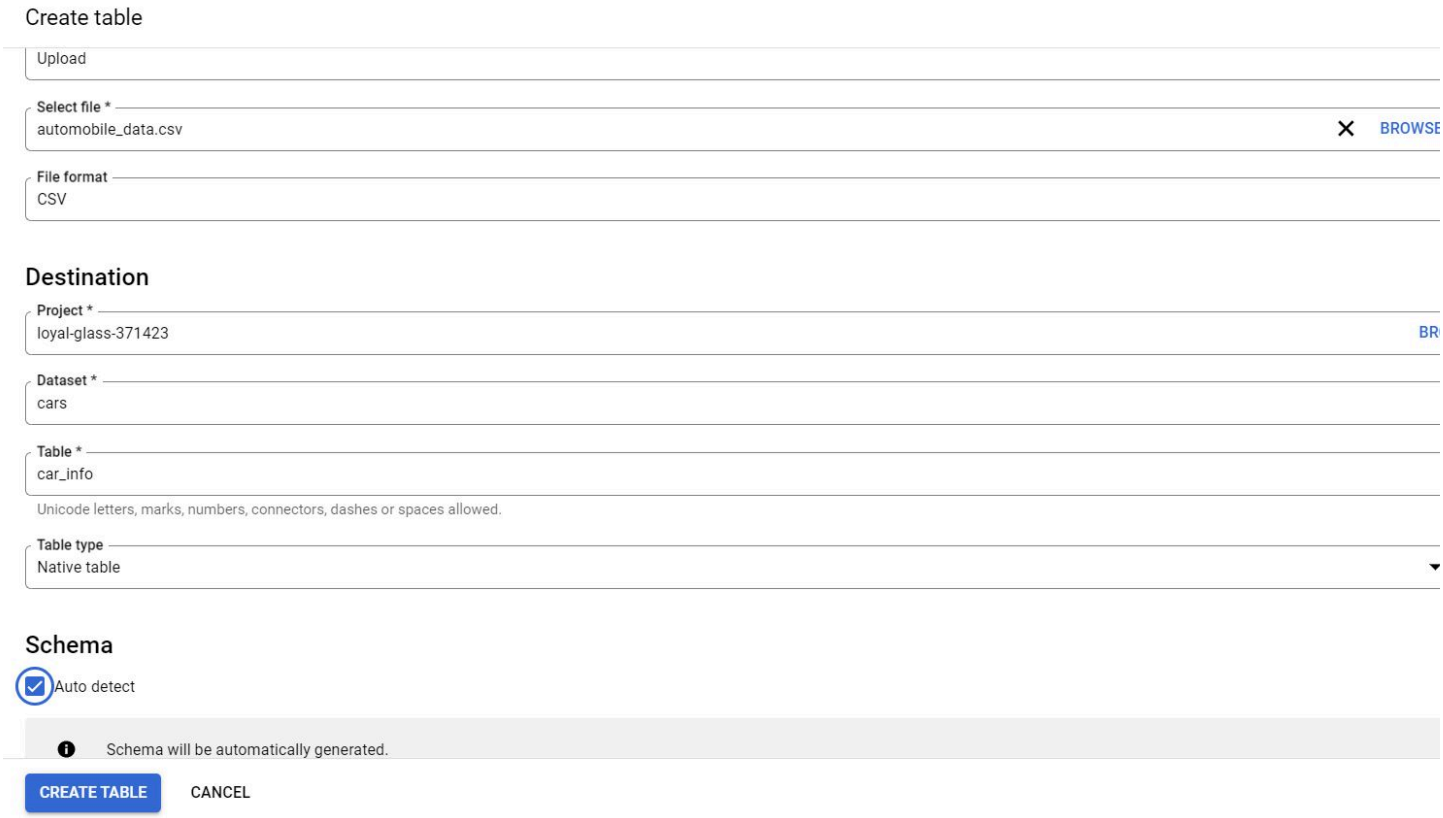
Now that you've created a dataset. You'll create a custom table to house your data. This will enable you to use SQL queries to explore and clean data.

After clicking on `cars` to open your newly created dataset, you will be able to add a custom table for the insertion of your downloaded data.

From the `cars` dataset info window, click CREATE TABLE.



Within the Create table window, upload the `automobile_data.csv` by clicking the drop-down arrow under Source and choosing the Upload option. Click the BROWSE button navigate to the folder where your .csv document is located, and notice the File format will automatically change to CSV. Ensure the dataset name is `cars` and name your table Set the schema to Auto-detect, and finally click the Create table button.



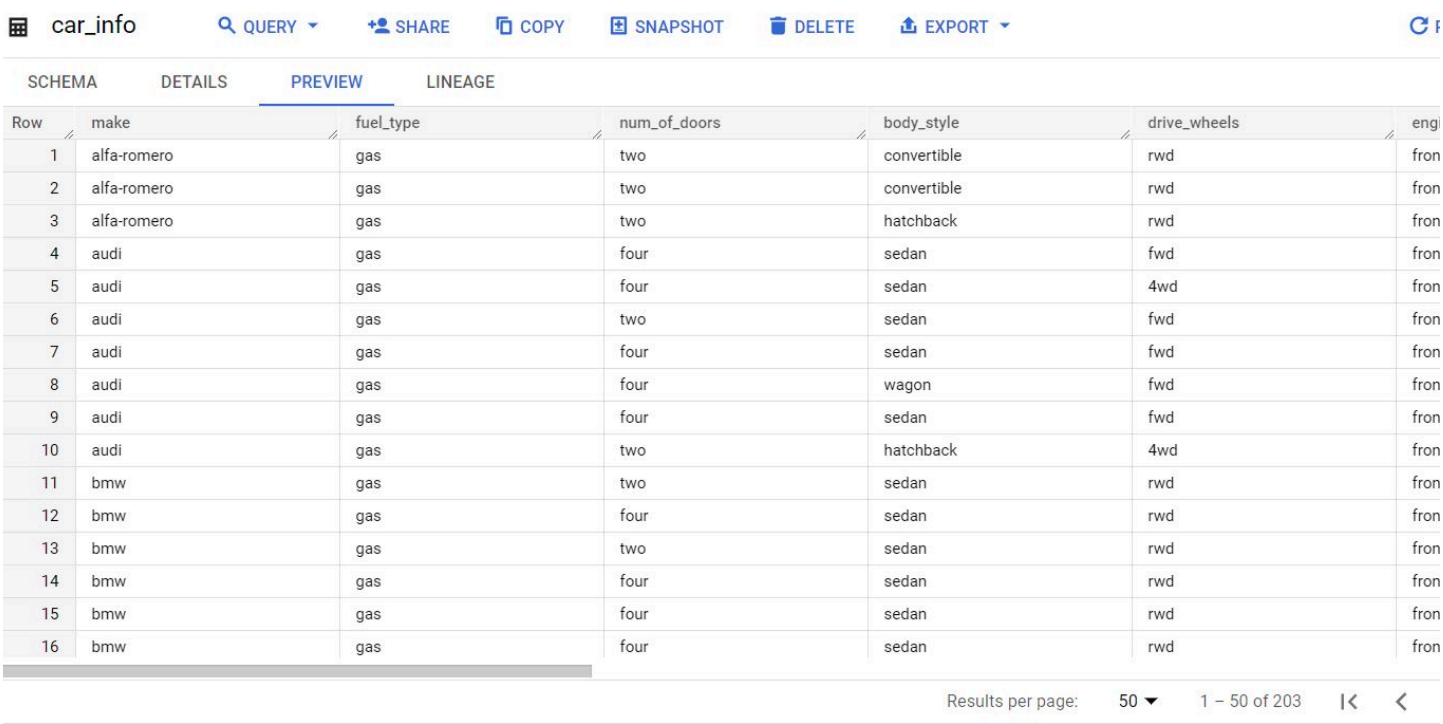
After creating your table, it will appear in your Explorer pane. You can click on the newly created table, `car_info`, to explore the SCHEMA and DETAILS buttons within your da Once you have gotten familiar with your data, you can start querying it.

Step 4: Understand Why YoClean Your Data?

Your new dataset contains historical sales data, including details such as car features and prices. You can use this data to find the top 10 most popular cars and trims. But befo perform your analysis, you'll need to make sure your data is clean. If you analyze dirty data, you could end up presenting the wrong list of cars to the investors. That may cause lose money on their car inventory investment.
In the remaining steps you'll clean your data.

Step 5: Inspect the fuel_type column

The first thing you want to do is inspect the data in your table so you can find out if there is any specific cleaning that needs to be done. Get an initial understanding of the data clicking on the PREVIEW tab that sits below the car_info toolbar.



Row	make	fuel_type	num_of_doors	body_style	drive_wheels	engi
1	alfa-romero	gas	two	convertible	rwd	fron
2	alfa-romero	gas	two	convertible	rwd	fron
3	alfa-romero	gas	two	hatchback	rwd	fron
4	audi	gas	four	sedan	fwd	fron
5	audi	gas	four	sedan	4wd	fron
6	audi	gas	two	sedan	fwd	fron
7	audi	gas	four	sedan	fwd	fron
8	audi	gas	four	wagon	fwd	fron
9	audi	gas	four	sedan	fwd	fron
10	audi	gas	two	hatchback	4wd	fron
11	bmw	gas	two	sedan	rwd	fron
12	bmw	gas	four	sedan	rwd	fron
13	bmw	gas	two	sedan	rwd	fron
14	bmw	gas	four	sedan	rwd	fron
15	bmw	gas	four	sedan	rwd	fron
16	bmw	gas	four	sedan	rwd	fron

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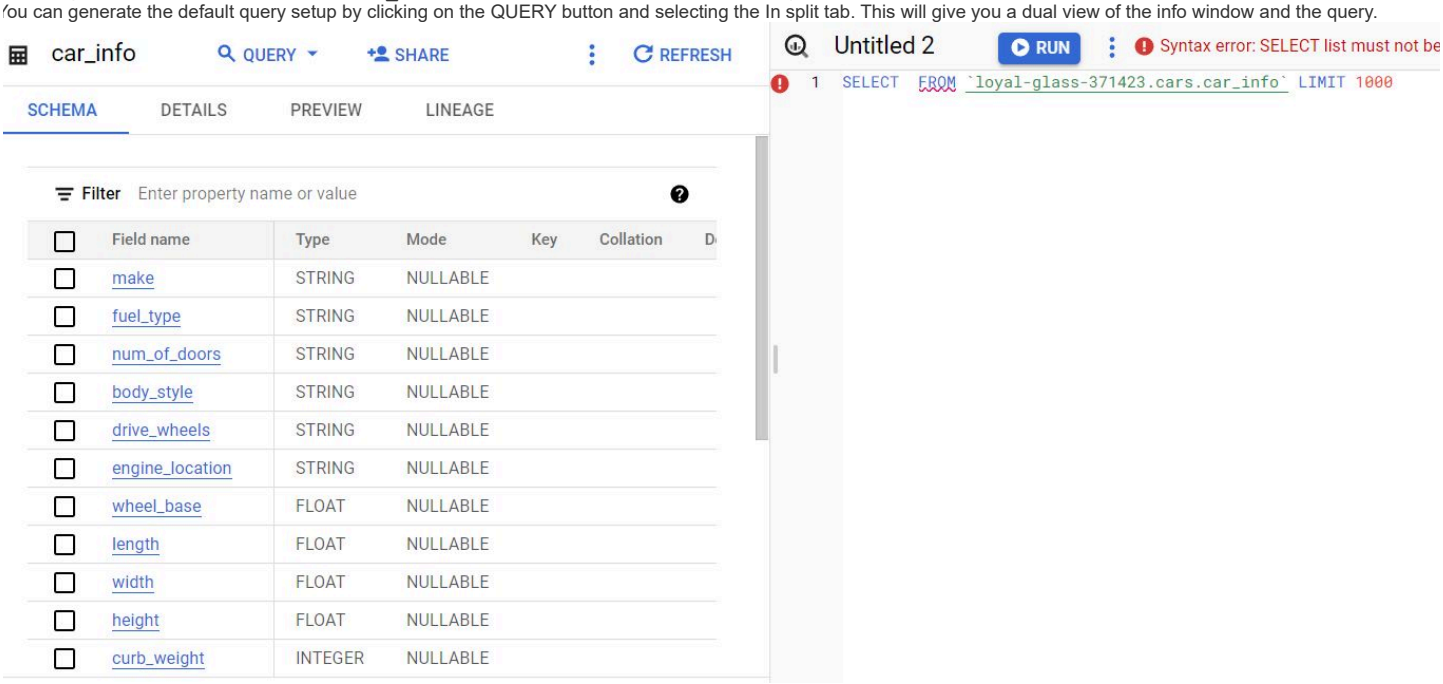
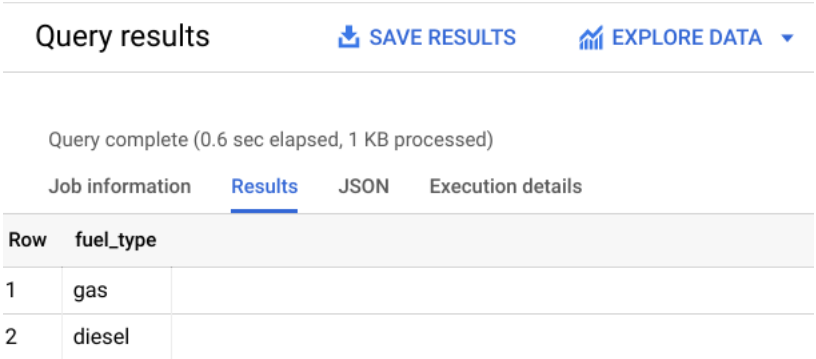
According to the data's description, the **`fuel_type`** column should only have two unique string values: **`diesel`** and **`gas`**. To check and make sure that's true, run the followin You can generate the default query setup by clicking on the QUERY button and selecting the In split tab. This will give you a dual view of the info window and the query.



Next, we can generate the first query in the workspace:

```
SELECT
  DISTINCT fuel_type
FROM
  your project name.cars.car_info
LIMIT 1000
```

NOTE: Within the **`FROM`** clause of the syntax above, you will need to begin the **`Table ID`** line with your personalized project name, period, the dataset name, period, and end v able name. It's important to understand that the personal project name will be unique to each learner. You can also locate and copy the full **`Table ID`** filename by clicking on th option tab in your **`car_info`** Table info window. Once copied, paste it after the **`FROM`** clause and run the above query.
This returns the following results:



Row	fuel_type
1	gas
2	diesel

This confirms that the `fuel_type` column doesn't have any unexpected values. Also note that the default `LIMIT 1000` is added to your query, but in this case, BigQuery is only wo distinct fuel types.

Step 6: Inspect the length column

Next, you will inspect a column with numerical data. The `length` column should contain numeric measurements of the cars. So you will check that the minimum and maximum he dataset align with the data description, which states that the lengths in this column should range from 141.1 to 208.1. Run this query to confirm:

```
SELECT
  MIN(length) AS min_length,
  MAX(length) AS max_length
FROM
  you project name.cars.car_info;
```

Your results should confirm that 141.1 and 208.1 are the minimum and maximum values respectively in this column.

Row	min_length	max_length
1	141.1	208.1

Step 7: Fill in Missing Data

Missing values can create errors or skew your results during analysis. You're going to want to check your data for null or missing values. These values might appear as a blank word `null` in BigQuery.
You can check to see if the `num_of_doors` column contains null values using this query:

```
SELECT
  *
FROM
  your project name.cars.car_info
WHERE
  num_of_doors IS NULL;
```

This will select any rows with missing data for the `num_of_doors` column and return them in your results table. You should get two results, one Mazda and one Dodge:

Row	make	fuel_type	num_of_doors	body_style
1	dodge	gas	*null*	sedan
2	mazda	diesel	*null*	sedan

In order to fill in these missing values, you check with the sales manager, who states that all Dodge gas sedans and all Mazda diesel sedans sold had four doors. If you are usi BigQuery free trial, you can use this query to update your table so that all Dodge gas sedans have four doors:

```
UPDATE
  your project name.cars.car_info
SET
  num_of_doors = "four"
WHERE
  make = "dodge"
  AND fuel_type = "gas"
  AND body_style = "sedan";
```

You should get a message telling you that three rows were modified in this table. To make sure, you can run the previous query again:

```
SELECT
  *
FROM
  your project name.cars.car_info
WHERE
  num_of_doors IS NULL;
```

Now, you only have one row with a null value for `num_of_doors`. Repeat this process to replace the null value for the Mazda.

If you are using the BigQuery Sandbox, you can skip these `UPDATE` queries; they will not affect your ability to complete this activity.

Step 8: Identify Potential Errors

Once you have finished ensuring that there aren't any missing values in your data, you'll want to check for other potential errors. You can use `SELECT DISTINCT` to check what exist in a column. You can run this query to check the `num_of_cylinders` column:

```
SELECT
  DISTINCT num_of_cylinders
```

```
FROM
  your project name.cars.car_info;
```

After running this, you notice that there are one too many rows. There are two entries for two cylinders: rows 6 and 7. But the *two* in row 7 is misspelled.

Row	num_of_cylinders
1	four
2	six
3	five
4	three
5	twelve
6	two
7	tow
8	eight

To correct the misspelling for all rows, you can run this query if you have the BigQuery free trial:

```
UPDATE
  your project name.cars.car_info
SET
  num_of_cylinders = "two"
WHERE
  num_of_cylinders = "tow";
```

You will get a message alerting you that one row was modified after running this statement. To check that it worked, you can run the previous query again:

```
SELECT
  DISTINCT num_of_cylinders
FROM
  your project name.cars.car_info;
```

Next, you can check the **`compression_ratio`** column. According to the data description, the **`compression_ratio`** column values should range from 7 to 23. Just like when checked the length values , you can use **`MIN`** and **`MAX`** to check if that's correct:

```
SELECT
  MIN(compression_ratio) AS min_compression_ratio,
  MAX(compression_ratio) AS max_compression_ratio
FROM
  your project name.cars.car_info;
```

Notice that this returns a maximum of 70. But you know this is an error because the maximum value in this column should be 23, not 70. So the 70 is most likely a 7.0. Run the query again without the row with 70 to make sure that the rest of the values fall within the expected range of 7 to 23.

```
SELECT
  MIN(compression_ratio) AS min_compression_ratio,
  MAX(compression_ratio) AS max_compression_ratio
FROM
  your project name.cars.car_info
WHERE
  compression_ratio <> 70;
```

Now the highest value is 23, which aligns with the data description. So you'll want to correct the 70 value. You check with the sales manager again, who says that this row was error and should be removed. Before you delete anything, you should check to see how many rows contain this erroneous value as a precaution so that you don't end up deleti your data. If there are too many (for instance, 20% of your rows have the incorrect 70 value), then you would want to check back in with the sales manager to inquire if these sh deleted or if the 70 should be updated to another value. Use the query below to count how many rows you would be deleting:

```
SELECT
   COUNT(*) AS num_of_rows_to_delete
FROM
   your project name.cars.car_info
WHERE
   compression_ratio = 70;
```

Turns out there is only one row with the erroneous 70 value. So you can delete that row using this query:

```
DELETE your project name.cars.car_info
WHERE compression_ratio = 70;
```

If you are using the BigQuery sandbox, you can replace **`DELETE`** with **`SELECT`** to see which row would be deleted.

Step 9: Ensure Consistency

Finally, you want to check your data for any inconsistencies that might cause errors. These inconsistencies can be tricky to spot—sometimes even something as simple as an e can cause a problem.

Check the **drive_wheels** column for inconsistencies by running a query with a **SELECT DISTINCT** statement:

```
SELECT
  DISTINCT drive_wheels
FROM
  your project name.cars.car_info;
```

It appears that 4wd appears twice in results. However, because you used a **SELECT DISTINCT** statement to return unique values, this probably means there's an extra space i the 4wd entries that makes it different from the other 4wd.

Row	drive_wheels
1	rwd
2	fwd
3	4wd
4	4wd

To check if this is the case, you can use a **LENGTH** statement to determine the length of how long each of these string variables:

```
SELECT
  DISTINCT drive_wheels,
  LENGTH(drive_wheels) AS string_length
FROM
  your project name.cars.car_info;
```

According to these results, some instances of the 4wd string have four characters instead of the expected three (4wd has 3 characters). In that case, you can use the **TRIM** fun emove all extra spaces in the **drive_wheels** column if you are using the BigQuery free trial:

```
UPDATE
  your project name.cars.car_info
SET
  drive_wheels = TRIM(drive_wheels)
WHERE TRUE;
```

Then, you run the **SELECT DISTINCT** statement again to ensure that there are only three distinct values in the drive_wheels column:

```
SELECT
  DISTINCT drive_wheels
FROM
  your project name.cars.car_info;
```

And now there should only be three unique values in this column! Which means your data is clean, consistent, and ready for analysis!

Pro Tip: Save the Activity Template

Be sure to save a copy of the .csv template you used to complete this activity. You can use it for further practice or to help you work through your thought processes for similar t uture data analyst role.

1. Reflection

What is the maximum value in the price column of the **car_info** table?

- ○ 5,1180
- ○ 12,978
- ○ 16,430
- ◉ 45,400

✓ Correct
The maximum value is 45,400. To ensure that the values in the price column fell within the expected range, you used the **MIN** and **MAX** functions to determine that the maximum price was 45,400. Knowing this, you were able to clean this column and prepare for analysis. Going forward, you will continue to check columns with numeric data in BigQuery to make sure your data is clean. This will help you quickly identify issues with your data that might cause errors during analysis.

2. In the text box below, write 2-3 sentences (40-60 words) in response to each of the following questions:

- Why is cleaning data before your analysis important?
- Which of these cleaning techniques do you think will be most useful for you in the future?

Why is cleaning data before your analysis important?
Cleaning data ensures accuracy, consistency, and reliability in analysis results, helping to prevent errors and misleading insights. Without clean data, analysis can produce incorrect outcomes, leading to poor decisions and potential financial losses. Clean data improves efficiency and enables analysts to generate meaningful and actionable insights.

Which of these cleaning techniques do you think will be most useful for you in the future?
The TRIM function to remove extra spaces and check for missing or inconsistent values will be particularly useful. These techniques ensure data uniformity, especially in text columns where extra spaces or slight variations can lead to duplicate values or errors in grouping and filtering. They are simple but effective for preventing many common data issues.

Correct
Congratulations on completing this hands-on activity! In this activity you checked your data for errors and fixed any inconsistencies. A good response would include that cleaning data is an important step of the analysis process that will save you time and help ensure accuracy in the future.
Cleaning data where it lives is incredibly important for analysts. For instance, you were able to use SQL to complete multiple cleaning tasks, which allows you to clean data stored in databases. In upcoming activities, you will use your cleaning skills to prepare for analysis!