Hands-On Activity: Clean data using SQL

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 queries. In this 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.

In 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 they can make 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 analysts.

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.

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

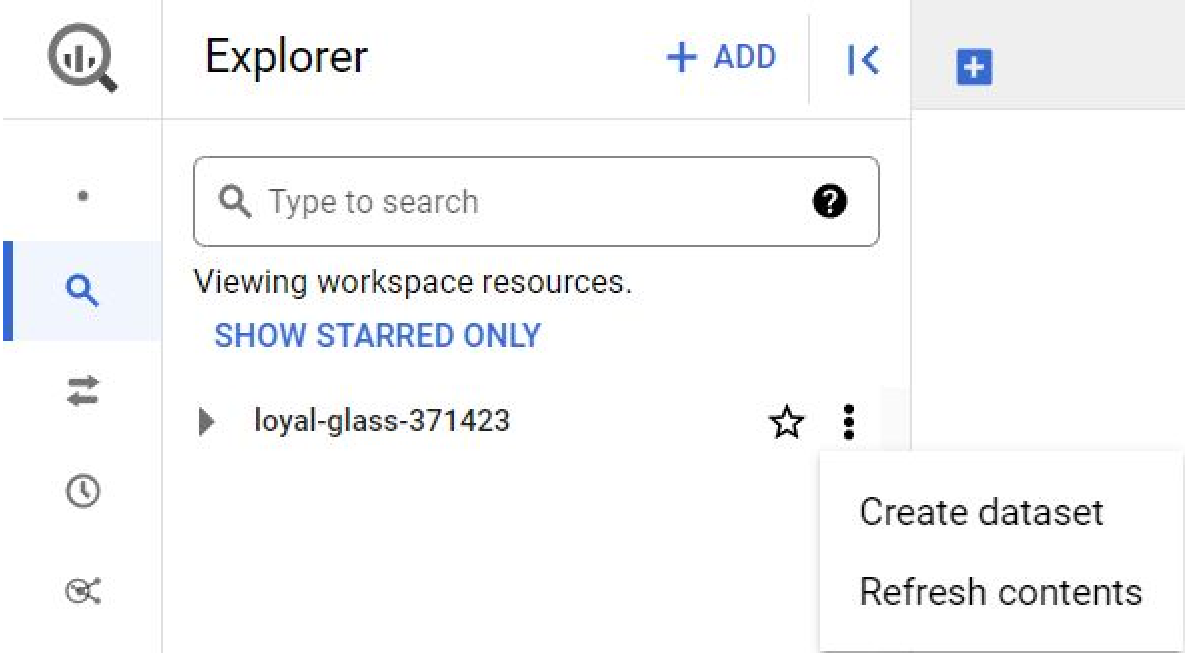
OR

automobile_data

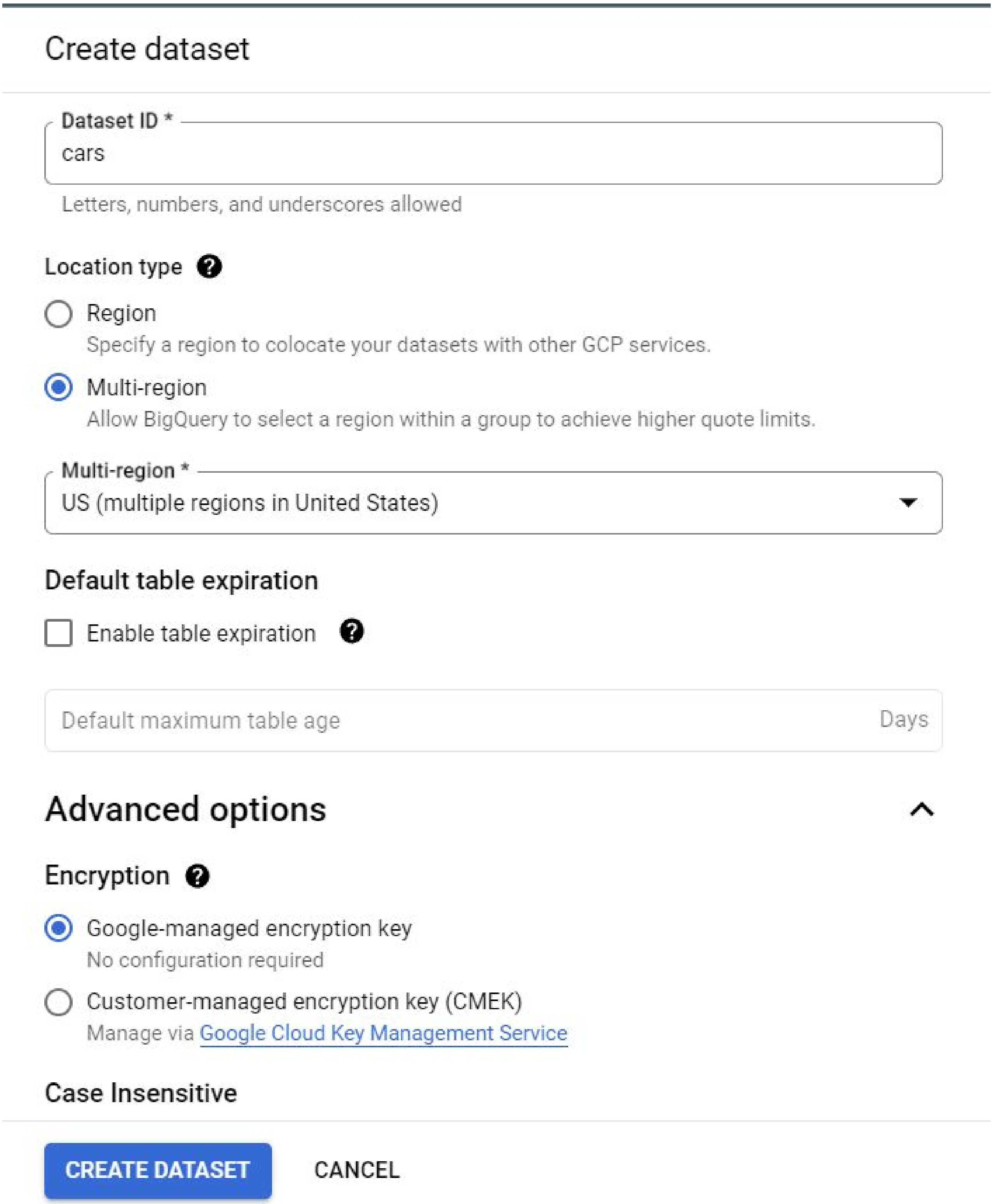
CSV File

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 in United States),** and the **Encryption** as **Google-managed encryption key** default settings. Then, click the **CREATE DATASET** button.



Create dataset

Dataset ID *
cars
Letters, numbers, and underscores allowed

Location type
○ Region
Specify a region to colocate your datasets with other GCP services.
● Multi-region
Allow BigQuery to select a region within a group to achieve higher quote limits.

Multi-region *
US (multiple regions in United States)

Default table expiration
□ Enable table expiration

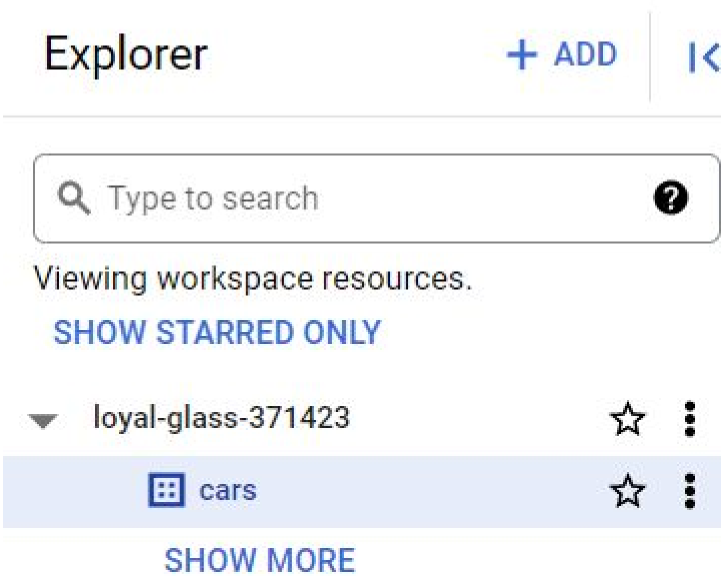
Default maximum table age Days

Advanced options

Encryption
● Google-managed encryption key
No configuration required
○ Customer-managed encryption key (CMEK)
Manage via Google Cloud Key Management Service

Case Insensitive

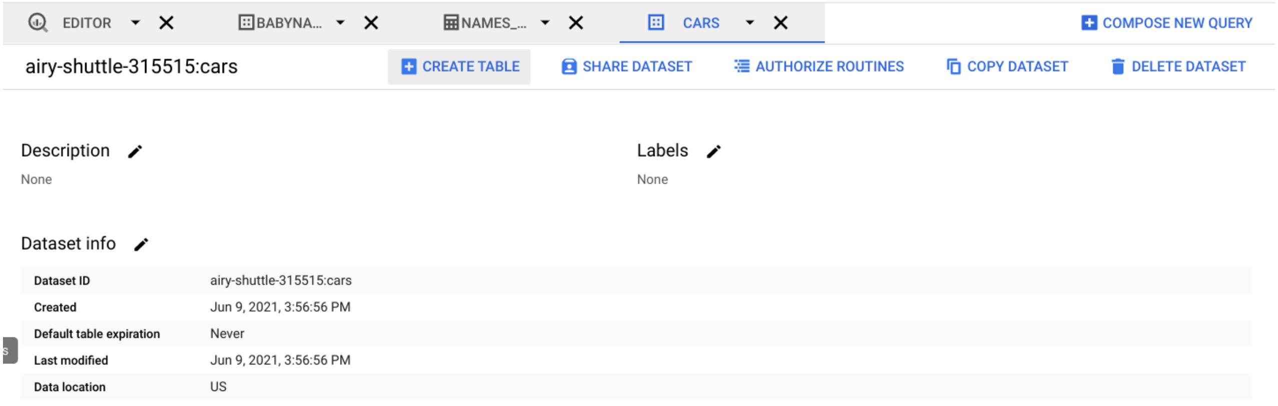
The *cars* dataset should appear under your project in the Explorer pane as shown below.



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**.



Description

None

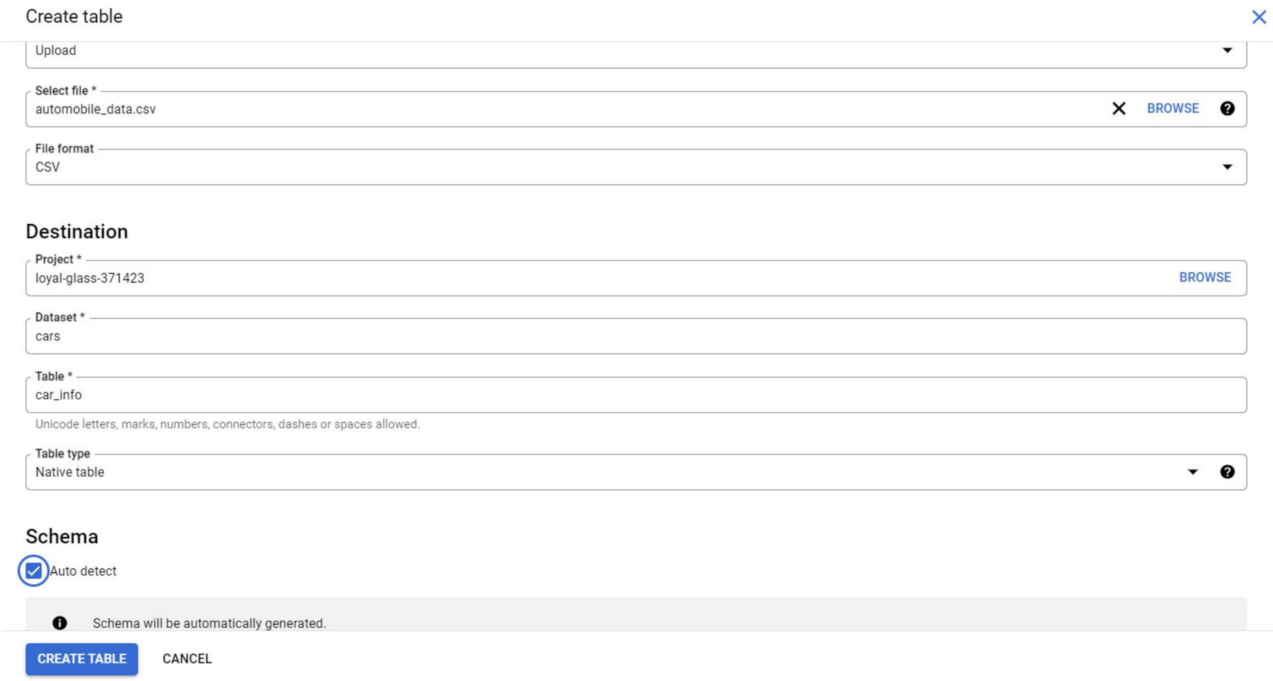
Labels

None

Dataset info

Dataset ID	airy-shuttle-315515:cars
Created	Jun 9, 2021, 3:56:56 PM
Default table expiration	Never
Last modified	Jun 9, 2021, 3:56:56 PM
Data location	US

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 and 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 *car_info***.** Set the schema to Auto-detect, and finally click the **Create table** button.



Create table

Upload

Select file * automobile_data.csv

File format CSV

Destination

Project * loyal-glass-371423

Dataset * cars

Table * car_info

Unicode letters, marks, numbers, connectors, dashes or spaces allowed.

Table type Native table

Schema

☑ Auto detect

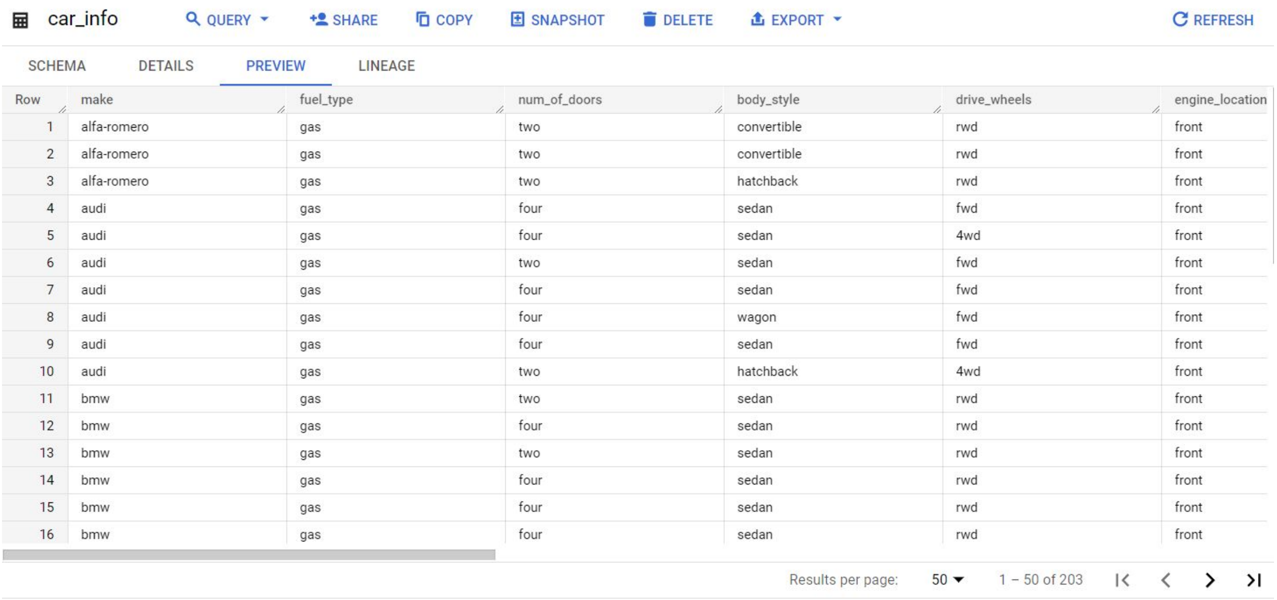
Schema will be automatically generated.

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 data page. Once you have gotten familiar with your data, you can start querying it.

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 before you can 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 them to lose money on their car inventory investment.

Continue below to clean your data.

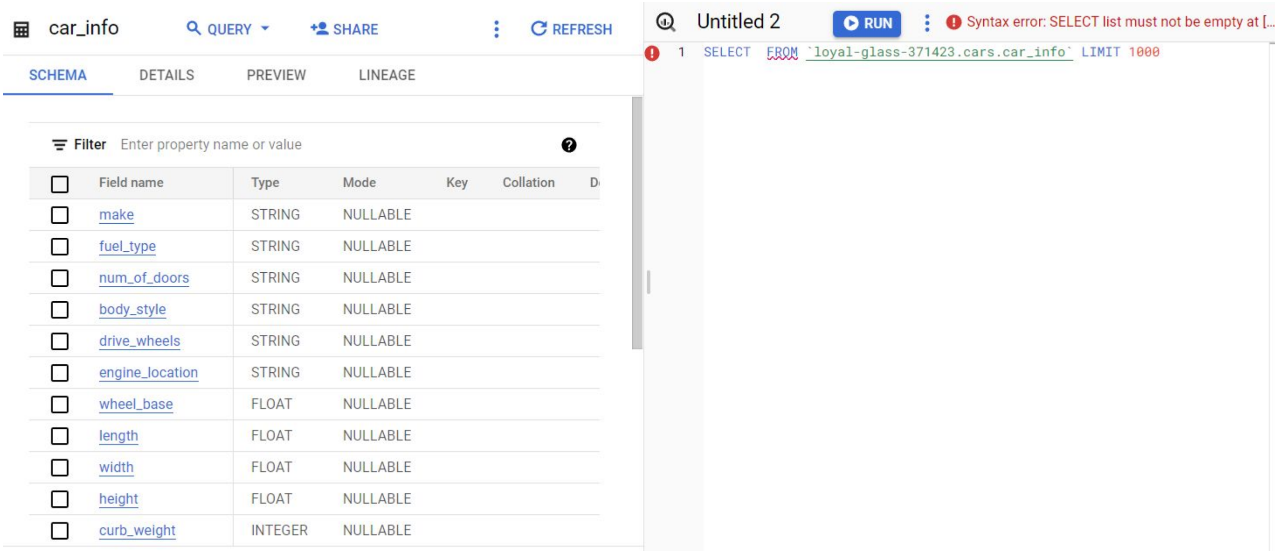
The first thing you want to do is inspect the data in your table so you can find out if there is any specific cleaning that needs to be done. Get an initial understanding of the data table by clicking on the **PREVIEW** tab that sits below the **car_info** toolbar.



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

Results per page: 50 1 – 50 of 203

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 following query. 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.



Syntax error: SELECT list must not be empty at [...

```
SELECT FROM `loyal-glass-371423.cars.car_info` LIMIT 1000
```

☐	Field name	Type	Mode	Key	Collation	D
☐	make	STRING	NULLABLE			
☐	fuel_type	STRING	NULLABLE			
☐	num_of_doors	STRING	NULLABLE			
☐	body_style	STRING	NULLABLE			
☐	drive_wheels	STRING	NULLABLE			
☐	engine_location	STRING	NULLABLE			
☐	wheel_base	FLOAT	NULLABLE			
☐	length	FLOAT	NULLABLE			
☐	width	FLOAT	NULLABLE			
☐	height	FLOAT	NULLABLE			
☐	curb_weight	INTEGER	NULLABLE			

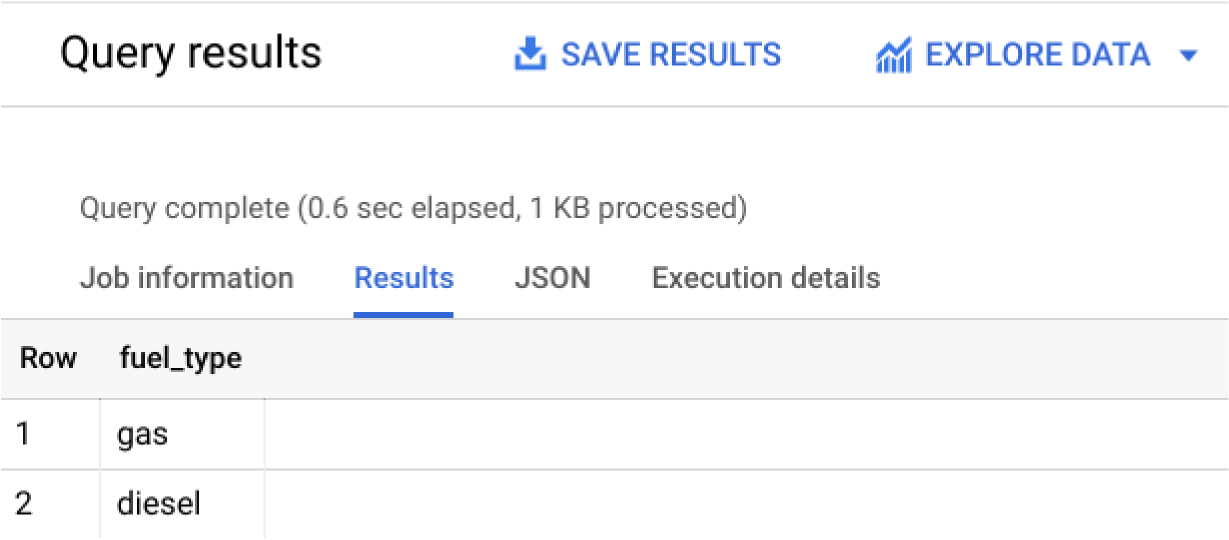
Next, we can generate the first query in the workspace:

```
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 with the table 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 the **DETAIL** 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:



Query complete (0.6 sec elapsed, 1 KB processed)

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 returning two distinct fuel types.

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 lengths in the 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:

5

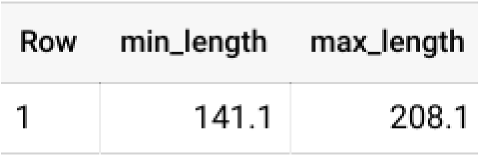
2

3

4

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

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

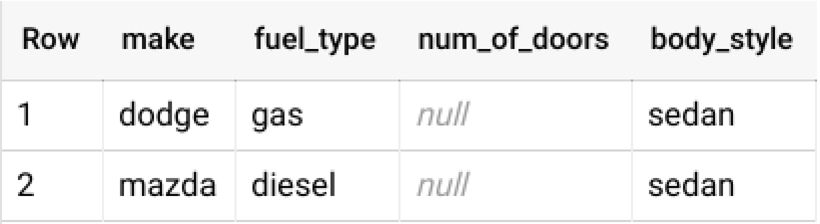
Missing values can create errors or skew your results during analysis. You’re going to want to check your data for null or missing values. These values might appear as a blank cell or the word in BigQuery.

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 using the BigQuery free trial, you can use this query to update your table so that all Dodge gas sedans have four doors:

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

```
SET
  num_of_doors = "four"
UPDATE
```

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.

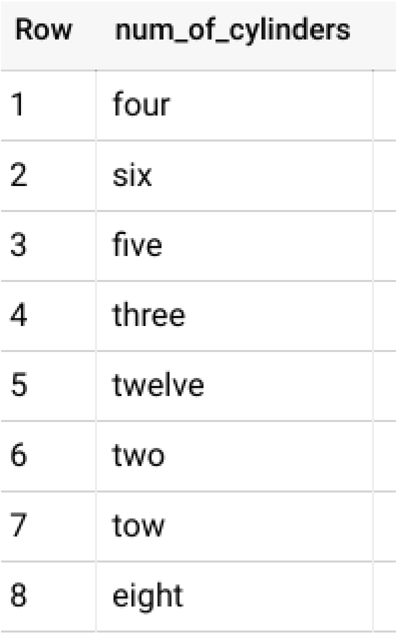
If you are using the BigQuery Sandbox, you can skip these *UPDATE* queries; they will not affect your ability to complete this activity.

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 values 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.

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



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

```
  num_of_cylinders = "tow";

SET

  num_of_cylinders = "two"

WHERE

UPDATE

  your project name.cars.car_info
```

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 you 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 above 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 made in 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 deleting 50% of 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 should be deleted or if the 70 should be updated to another value. Use the query below to count how many rows you would be deleting:

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

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.

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 extra space can cause a problem.

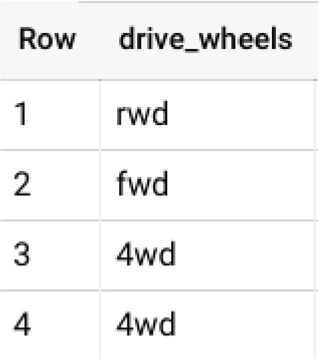
Check the *drive_wheels* column for inconsistencies by running a query with a *SELECT DISTINCT* statement:

```
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 in one of the 4wd entries that makes it different from the other 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;
```



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

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* function to remove 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!

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 tasks in a future data analyst role.

1.

Question 1

Reflection

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

1 / 1 point

✓
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.

Question 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?

1 / 1 point

Data cleaning is vital for accurate, reliable analysis. Dirty data leads to misleading results. Cleaning saves time by letting you focus on insights, not data quality 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!