

📍 **Milestone 4** | London Transportation Journey Survey

INTRODUCTION: A great source for datasets to work from can be found from government resources. More and more governing bodies – from the national level all the way down to the city level – are making their data available for the public to download and analyze. The types of data often cover a wide range of topics, such as energy use and conservation, public transportation, and the fine arts and education. Of course, raw data isn't much use without the skills to turn it into useful information – but those skills are what you've been building throughout this entire course!

HOW IT WORKS: Follow the prompts in the questions below to investigate your data. Post your answers in the provided boxes: the **yellow boxes** for the queries you write, **purple boxes** for visualizations and **blue boxes** for text-based answers. When you're done, export your document as a pdf file and submit it on the Milestone page – see instructions for creating a PDF at the end of the Milestone.

RESOURCES: If you need hints on the Milestone or are feeling stuck, there are multiple ways of getting help. Attend Drop-In Hours to work on these problems with your peers, or reach out to the HelpHub if you have questions. Good luck!

PROMPT: In this particular Milestone, we will be working with data that has been made available by Transport for London (TfL). More specifically, we'll be looking at data from their Rolling Origin and Destination Survey (RODS). RODS seeks to model typical passenger behaviors on the London Underground system. It goes beyond just knowing how many passengers enter or exit each station, at what time. It tries to model motivations for taking the Tube, such as for work or for leisure. The inclusion of this information can paint a picture of how the system is used that is deeper than standard usage statistics can perform alone.

SQL App: [Here's that link](#) to our specialized SQL app, where you'll write your SQL queries and interact with the data.

– Data Set **Description**

The TfL RODS data (`tfl.rods`) models activity on the London Underground that would take place on a typical November weekday. The slice of the data that has been pulled out from the survey consists of 6295 rows across six columns:

- **entry_zone:** Zone of the station in which a passenger starts their journey. Zone 1 encompasses the central part of London, and each higher-numbered Zone is a ring around the previous. In other words, Zone 5 represents stations that are furthest out from the central part of London. [See here for a visualization of Zones in London.](#)
- **time_period:** Time period in which the passenger started their trip. There are six periods of day: Early (5am–7am), AM Peak (7am–10am), Midday (10am–4pm), PM Peak (4pm–7pm), Evening (7pm–10pm), and Late (10pm–5am).
- **origin_purpose:** The reason for the passenger to have chosen the station from which they begin their journey. There are eight categories: Home, Work, Shop, Education, Tourist, Hotel, Other, and Unknown/Not Given.
- **destination_purpose:** The reason for the passenger to have chosen the station from which they end their journey. The possible values for this feature are the same eight categories as for the origin_purpose feature.
- **distance:** Approximate distance between the passenger's origin and destination stations. Distances are grouped into five levels: <3 km, 3–8 km, 8–16 km, 16–24 km, and over 24 km.
- **daily_journeys:** Number of daily journeys matching the entry, time period, purpose, and distance profile indicated by the data row. This number is derived from the RODS model, rather than a specific day of data collection.

– **Task 1:** General Usage Statistics

Although we'd like to eventually understand why passengers use the rail system, we should start by making some summaries of the rail system in general.

- A.** Write a query that returns the sum total of journeys. This total represents the volume of activity expected on a typical day of operations for the Underground system!

```
SELECT
  SUM(daily_journeys) AS sum_journeys
FROM
  tfl.rods;
```

There is a sum of 4,878,330 daily journeys on a typical day of operations for the underground system.

- B.** Add to your query to return the number of journeys made that originate from each Zone. What percentage of journeys start from a Zone 1 station? (Divide the Zone 1 value by the value you got from part A; you won't calculate this in SQL!)

```
SELECT
  entry_zone,
  SUM(daily_journeys) AS sum_journeys
FROM
  tfl.rods
GROUP BY
  entry_zone;
```

Approximately 52% of journeys start from the Zone 1 station in the London underground system.

- C. Revise your query to return the number of journeys made in each period of day. Which time period has the highest total volume of passengers?

```
SELECT
    time_period,
    SUM(daily_journeys) AS sum_journeys
FROM
    tfl.rods
GROUP BY
    time_period
ORDER BY
    sum_journeys DESC;
```

The highest total volume of passengers that the London underground system experiences is during the PM peak time period with about 1,367,309 trips being made daily.

– Task 2: For what reasons do people use the London Underground?

Let's start adding in the survey information about the reasons why passengers take trips on the subway system.

- A. Write a query that returns the number of journeys made grouped by their reasons for the origin station. Which journey purposes have the highest number of trips, and what does this tell you about how the subway system is used?

```
SELECT
    origin_purpose,
```

```
SUM(daily_journeys) AS sum_journeys
FROM
  tfl.rods
GROUP BY
  origin_purpose
ORDER BY
  sum_journeys DESC;
```

The highest number of journeys are being made with the purpose of traveling home with a volume of 1,835,593 trips. This tells us that the citizens of London utilize the underground system frequently as a medium to travel from their homes as a starting point.

- B.** Change the grouping on your query to be on both the origin purpose and the destination purpose, so that you get the number of journeys by each origin-destination purpose pair. Does this support or change your understanding of what you observed in the previous part?

```
SELECT
  origin_purpose,
  destination_purpose,
  SUM(daily_journeys) AS sum_journeys
FROM
  tfl.rods
GROUP BY
  origin_purpose,
  destination_purpose
ORDER BY
  sum_journeys DESC;
```

The results of this query support my observation because we can identify the home as a continued popular origin purpose.

- C. Is there a bias in when people make their trips, depending on why they make a trip? Modify your query to get the number of trips grouped by origin purpose and time of day. Sort by origin purpose so that all of the trips for a specific reason are returned together. Interpret the output: Do people travel from Home or Work at the expected time periods?

```
SELECT
    origin_purpose,
    time_period,
    SUM(daily_journeys) AS sum_journeys
FROM
    tfl.rods
GROUP BY
    origin_purpose,
    time_period
ORDER BY
    origin_purpose ASC;
```

There is a travel bias of utilizing the underground system during the AM peak period for those with an origin purpose; with a volume of 1,076,902 trips. This is around the time people usually start work assuming a 9 am–5 pm work model. A similar bias is observed with the work origin purpose. Folks typically travel the most on the underground system during the PM peak hours with a volume of 732,409 trips. Assuming a 9 am–5 pm work week, this is around the time when people get off of work.

- D. Is there a difference in travel purposes based on which zone is the trip origin? Modify your query to get the number of trips grouped by origin purpose and entry zone. Sort by entry zone so that all of the frequency counts for a single zone are in consecutive rows. Interpret the output: how does the ranking of Home and Work purposes change as we change Zone?

```
SELECT
    origin_purpose,
    entry_zone,
    SUM(daily_journeys) AS sum_journeys
FROM
    tfl.rods
GROUP BY
    origin_purpose,
    entry_zone
ORDER BY
    entry_zone ASC;
```

Observing the results of our query, the underground system is extremely popular for work-origin purposes in relation to Zone 1. However, as we move further away the daily journey is dominated by home-origin purposes. In Zone 2 more people use the underground system with an origin point of home with a volume of 586,397 trips. In Zone 3, a volume of 299,882 trips is obtained by home-origin individuals. In Zone 4, the home origin purpose individuals account for a volume of 169,060 trips. Finally, in Zone 5, a volume of 126,881 trips is accounted for by individuals with a home origin. We can conclude that as we move further away from the city, folks are more likely to start from home than their jobs.


– LevelUp

There's a lot of finer investigations that you can do with the RODS data, but it is most useful when you can focus your attention on just part of the data. We learned that the majority of rides for home/work happened during the peak times. Let's investigate how that changes for tourism related travel.

- A.** Write a query that returns the total number of journeys grouped by origin purpose, destination purpose, and time period. Filter to trips where either origin or destination is done for tourism purposes. How do travel periods for tourism related travel differ from those for work commute purposes?

```
SELECT
    origin_purpose,
    destination_purpose,
    time_period,
    SUM(daily_journeys) AS sum_journeys
FROM
    tfl.roads
WHERE
    origin_purpose = 'Tourist'
    OR destination_purpose = 'Tourist'
GROUP BY
    origin_purpose,
    destination_purpose,
    time_period
ORDER BY
    sum_journeys DESC;
```

Work-related commutes are typically abundant during the “PM peak” period. The result of our query shows us that commutes related to tourism usually take place during the “Midday” period. The difference between the two purposes relies on when a commuter decides to board the underground system.



Next, you will learn about how to apply two different kinds of clauses to filter aggregated data in two different ways. But if you're excited about this dataset or want to think ahead, you can try your hand at applying the `WHERE` keyword you learned about previously. The `WHERE` clause comes after `FROM` and before `GROUP BY`. Try to see how adding a `WHERE` clause on one or two different journey purposes cleans up the output, and see if it makes it easier to see trends on some of the less-common trip reasons.

– Submission

Great work completing this Milestone! To submit your completed Milestone, you will need to download / export this document as a PDF and then upload it to the Milestone submission page. You can find the option to download as a PDF from the File menu in the upper-left corner of the Google Doc interface.