**Demo Solution**

**Edmond Questions:**

Q-1:

Now, let's interpret the results:

* **Significance Level**: If we choose a significance level of, say, 0.05, then a p-value less than 0.05 indicates statistical significance.
* **Interpretation**:
  + Since the p-value for the one-tailed test (0.044264303) is less than 0.05, we reject the null hypothesis. This suggests that there is evidence to conclude that metro EV owners travel further than their regional counterparts.
  + For the two-tailed test, the p-value is 0.088528606, which is greater than 0.05 but less than 0.1. This suggests some evidence against the null hypothesis but not strong enough to reach conventional levels of statistical significance.

In conclusion, based on the one-tailed test, there is evidence to suggest that metro EV owners travel further annually compared to regional EV owners.

Top of Form

Q-2:

**Interpretation:**

* The p-value (0.1387) is greater than the chosen significance level (e.g., 0.05), indicating that we fail to reject the null hypothesis.
* Therefore, there is not enough evidence to conclude that there is a significant association between locality and EV towing.
* In other words, we do not have sufficient evidence to claim that fewer EV owners in metro areas are using their vehicles for towing compared to those in regional areas.
* The proportion of EV owners using their vehicles for towing in metro and regional areas can be calculated using the observed frequencies and the total number of EV owners in each area.

In summary, based on the chi-square test results, there is no significant association between locality and EV towing, and we cannot conclude that there are fewer EV owners in metro areas using their vehicles for towing than those in regional areas.

Q-3:

**Interpretation of Experiment Results:**

* **ANOVA Analysis**:
  + The ANOVA (Analysis of Variance) table provides information on the sources of variation and their associated statistics.
  + The "Between Groups" row indicates the variability between different household types, while the "Within Groups" row indicates the variability within each household type.
  + The F-statistic tests the hypothesis that there are no differences between the means of the groups.
  + The associated p-value (0.0095) is less than the chosen significance level (e.g., 0.05), indicating statistical significance.
  + Therefore, there is evidence to suggest that there is a significant difference in average fuel cost savings across different household types.
* **Conclusion**:
  + Based on the ANOVA results, we can conclude that there is a statistically significant difference in average fuel cost savings across household types.
  + Further post-hoc tests or analysis may be conducted to determine which specific household types differ significantly from each other in terms of fuel cost savings.
  + This information could be valuable for understanding variations in fuel consumption behavior and for developing targeted strategies or policies aimed at reducing fuel costs for different types of households.

Q-4:

Looking at the provided solution:

* **Economic**: Proportion of EV owners charging at home more than five times per week = 10/52 ≈ 0.1923 or 19.23%
* **Environment**: Proportion = 14/52 ≈ 0.2692 or 26.92%
* **Fuel Security**: Proportion = 17/52 ≈ 0.3269 or 32.69%
* **Health**: Proportion = 4/52 ≈ 0.0769 or 7.69%
* **Technology**: Proportion = 7/52 ≈ 0.1346 or 13.46%

Based on these proportions, we can observe differences in the proportions of EV owners who charge their vehicles at home more than five times per week depending on their motivation for purchasing an EV.

* **Fuel Security** appears to have the highest proportion of EV owners who charge their vehicles at home more than five times per week, followed by **Environment**, **Technology**, **Economic**, and finally **Health**.
* This suggests that the motivation or reason for purchasing an EV might influence the frequency of charging at home, with some motivations leading to a higher proportion of frequent charging.

Therefore, based on the provided proportions, we can conclude that there is indeed a difference in the proportion of EV owners who charge their vehicles at home more than five times per week based on their motivation for purchasing an EV.

Q-5:

1. **Overview:**
   * This analysis explores how the distances traveled in electric vehicles (EVs) are influenced by the locality (Metro vs. Regional) and types of trips (Holiday, Private, Work).
2. **Findings:**
   * Locality:
     + Total distance traveled in Metro areas: 177,000 km.
     + Total distance traveled in Regional areas: 174,000 km.
   * Types of Trips:
     + Holiday trips: 57,000 km.
     + Private trips: 67,000 km.
     + Work trips: 65,000 km.
3. **Insights:**
   * While trip types significantly affect distances traveled, there's minimal variation between Metro and Regional areas.
   * Private trips account for the highest distance traveled, followed by Work and Holiday trips.
4. **Recommendations:**
   * Focus on optimizing EV infrastructure and incentives to support private users, given their tendency for longer journeys.
   * Continued monitoring and analysis can inform targeted interventions for sustainable urban mobility.
5. **Limitations:**
   * The analysis is aggregate and doesn't capture individual variations or other influencing factors like infrastructure availability.

Q-6:

1. **Mean Attitude Scores:**
   * The mean Attitude Score for 2022 is approximately 5.56, while the mean Attitude Score for 2023 is approximately 6.83.
2. **t-Test Results:**
   * The calculated t-statistic is -3.232, which indicates the difference between the mean Attitude Scores of 2022 and 2023 is -3.232 standard deviations away from the mean difference.
   * The p-value associated with the t-statistic is 0.007984102 (two-tailed). This is less than the significance level of 0.05, indicating that the difference in attitude scores between 2022 and 2023 is statistically significant.
3. **Interpretation:**
   * Since the p-value is less than the chosen significance level (0.05), we reject the null hypothesis.
   * Therefore, we conclude that there is a significant change in the attitude of EV owners towards public EV charging infrastructure between 2022 and 2023.
4. **Direction of Change:**
   * The mean Attitude Score increased from 2022 to 2023, suggesting that, on average, EV owners showed greater support for the government's approach to public EV charging infrastructure in 2023 compared to 2022.

In conclusion, based on the results of the paired two-sample t-test, there is indeed evidence to suggest a significant change in the attitude of EV owners towards public EV charging infrastructure between 2022 and 2023, with an overall increase in support in 2023.