



# Homework #2

## Safest Mode of Travel Problem

### Background Information

In the United States, we often are told that commercial airlines are statistically the safest mode of travel. Yet, many people do not believe this due to the fact that plane crashes tend to be responsible for hundreds of deaths.



What really is the safest mode of transportation? What is the best way to travel long distances? Airplane, car, train, or bus?

### Problem Statement

In this assignment, students will analyze statistics from the U.S. Department of Transportation to determine the safest means of travel.

### Instructions

**IMPORTANT:** Complete the steps below in the order they are given. Completing the steps out of order may complicate the assignment or result in an incorrect result.

1. Download and extract the provided Data Files ZIP file. It contains the following files for use in this assignment:
  - a. **injuries.csv** – Injuries and fatalities by transportation mode between 1999 and 2014 [1].

Column Name	Type	Description
<b>Mode of Transportation</b>	Text	Name of transportation mode.
<b>1999</b>	Number	Number of injuries and fatalities for the listed mode of transportation in 1999.
<b>2002</b>	Number	Number of injuries and fatalities for the listed mode of transportation in 2002.
<b>2005</b>	Number	Number of injuries and fatalities for the listed mode of transportation in 2005.
<b>2008</b>	Number	Number of injuries and fatalities for the listed mode of transportation in 2008.
<b>2011</b>	Number	Number of injuries and fatalities for the listed mode of transportation in 2011.
<b>2014</b>	Number	Number of injuries and fatalities for the listed mode of transportation in 2014.



# Homework #2

## Safest Mode of Travel Problem

- b. **passengermiles.csv** – Number of passenger-miles on each transportation mode between 1999 and 2014 [1].

Column Name	Type	Description
<b>Mode of Transportation</b>	Text	Name of transportation mode.
<b>1999</b>	Number	Number of passenger-miles traveled in 1999.
<b>2002</b>	Number	Number of passenger-miles traveled in 2002.
<b>2005</b>	Number	Number of passenger-miles traveled in 2005.
<b>2008</b>	Number	Number of passenger-miles traveled in 2008.
<b>2011</b>	Number	Number of passenger-miles traveled in 2011.
<b>2014</b>	Number	Number of passenger-miles traveled in 2014.

2. Begin by creating a new Microsoft Excel workbook named **lastname\_firstname\_hw2\_smtp.xlsx**.
3. We must adjust the sheets in our workbook.
  - a. Rename *Sheet1* to *Passenger-Miles Traveled*.
  - b. Add a new sheet named *Injuries and Fatalities*.
  - c. Add a new sheet named *Injury and Fatality Rates*.
  - d. Add a new sheet named *Analysis Questions*.
4. Import the following items into the workbook:
  - a. **passengermiles.csv** file – Import starting in cell **A3** of the *Passenger-Miles Traveled* sheet. The file is comma-delimited and has headers.
  - b. **injuries.csv** file – Import starting in cell **A3** of the *Injuries and Fatalities* sheet. The file is comma-delimited and has headers.
5. We wish to apply formatting to the *Passenger-Miles Traveled* sheet.
  - a. Create a table based on cells **A3** through **G9** using a style of your choice. The table has headers.

The table will overlap external data ranges. Convert the selection to a table and remove all external connections.
  - b. We need to add additional table columns to store statistics and a sparkline.
    - i. Insert four new table columns to the right of existing column **G**.



# Homework #2

## Safest Mode of Travel Problem

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- c. Enter text in the cells as indicated below:
    - i. **A1**: Passenger-Miles Traveled
    - ii. **H3**: Minimum Value
    - iii. **I3**: Maximum Value
    - iv. **J3**: Passenger-Miles Increasing
    - v. **K3**: Sparkline
  - d. Merge-and-center cells **A1** through **K1**.
  - e. Apply the *Title* cell style to cell **A1**.
  - f. Format the cells as indicated below:
    - i. **B4** through **I9**: number with no decimal places, use 1000 separator
  - g. AutoFit the width of columns **A** through **K**.
  - h. Apply *Green-Yellow-Red* color scale conditional formatting to cells **B4** through **G9**.
6. We also wish to apply formatting to the *Injuries and Fatalities* sheet.
- a. Create a table based on cells **A3** through **G9** using a style of your choice. The table has headers.  
  
The table will overlap external data ranges. Convert the selection to a table and remove all external connections.
  - b. Enter text in the cells as indicated below:
    - i. **A1**: Injuries and Fatalities
  - c. Merge-and-center cells **A1** through **G1**.
  - d. Apply the *Title* cell style to cell **A1**.
  - e. Format the cells as indicated below:
    - i. **B4** through **G9**: number with no decimal places, use 1000 separator
  - f. AutoFit the width of columns **A** through **G**.
7. We must also apply formatting to the *Injury and Fatality Rates* sheet.
- a. Enter text in the below cells as indicated:
    - i. **A1**: Injury and Fatality Rates per Million Miles
    - ii. **A3**: Mode of Transportation
    - iii. **B3**: 1999
    - iv. **C3**: 2002



# Homework #2

## Safest Mode of Travel Problem

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- v. **D3**: 2005
  - vi. **E3**: 2008
  - vii. **F3**: 2011
  - viii. **G3**: 2014
  - ix. **A4**: Air - Commercial
  - x. **A5**: Air - General Aviation
  - xi. **A6**: Highway - Bus
  - xii. **A7**: Highway - Car
  - xiii. **A8**: Public Transit
  - xiv. **A9**: Railroad
- b. Merge (but not center) cells **A1** through **G1**.
  - c. Apply the *Title* cell style to cell **A1**.
  - d. Format cells **A3** through **G9** as a table using a style of your choice. The table has headers.
8. On the *Injury and Fatality Rates* sheet, we wish to calculate accident statistics.
- a. In column **B**, write a formula to calculate for each transportation mode the annual injury and fatality rate, which is defined as the number of injuries or fatalities per million passenger-miles traveled. Reference the values on the *Passenger-Miles Traveled* and *Injuries and Fatalities* sheets in your formula.
- You can calculate the injury and fatality rate using the formula:
- $$\frac{[Injuries\ and\ Fatalities\ for\ Year\ and\ Transportation\ Mode]}{[Passenger-Miles\ Traveled\ for\ Year\ and\ Transportation\ Mode]} * 1000000$$
- b. In columns **C** through **G**, duplicate your injury and fatality rate formula from column **B**.
9. We must apply additional formatting to the *Injury and Fatality Rates* sheet.
- a. Format the cells as indicated below:
    - i. **B4** through **G9**: number with 4 decimal places
    - b. AutoFit the width of columns **A** through **G**.
10. On the *Passenger-Miles Traveled* sheet, we wish to calculate passenger-miles traveled statistics.
- a. In column **H**, write a formula to calculate the minimum passenger-miles traveled for each mode of transportation.



# Homework #2

## Safest Mode of Travel Problem

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- b. In column **I**, write a formula to calculate the maximum passenger-miles traveled for each mode of transportation.
  - c. In column **J**, write a formula to determine if the mode of transportation's 2014 passenger-miles traveled was more than its 1999 miles. If it was, display *Increasing*; otherwise, display *Not Increasing*.
11. We wish to add a sparkline to the *Passenger-Miles Traveled* sheet to compare data.

In column **K**, insert a line-type sparkline based on the values in columns **B** through **G**.

12. We wish to create a chart to plot the injury and fatality rate for each year and mode of transportation.
- a. Create a 2-D line chart based on cells **A3** through **G9** of the *Injury and Fatality Rates* sheet. Move the chart to a new sheet named *Injury and Fatality Rates Chart*.

Ensure the years are shown as labels for the horizontal (category) axis, not plotted as chart data. Specify appropriate chart and axis titles.

- b. Add a trendline based on the injury and fatality rate for cars. Use the trendline type that best fits the data and project the values forward 5 periods (through the year 2029). Display the ***R-squared*** value on the chart.

**NOTE:** You cannot use the *Moving Average* type for your trendline.

13. We need to set up the *Analysis Questions* sheet so that it can store responses to the analysis questions.
- a. Enter text in the cells as indicated below:
    - i. **A1:** Question Number
    - ii. **B1:** Response
  - b. Bold the contents of row **1**.
  - c. AutoFit the width of column **A**. Set the width of column **B** to 100 (8.39").
  - d. Set the height for rows **2** through **5** to 110 (1.53").
  - e. Change the vertical alignment setting for columns **A** and **B** so that text is displayed at the top of each row.
  - f. Turn on text wrapping for column **B**.



# Homework #2

## Safest Mode of Travel Problem

14. Starting in row **2** of the *Analysis Questions* sheet, answer four of the five analysis questions below. Respond to one question per row.
- Which trendline type did you use on *Injury and Fatality Rates Chart*? Why did you choose this type of trendline?
  - The number of reported public transit injuries and fatalities dropped sharply in 2002. Aside from an actual dramatic reduction in the number of injuries and fatalities, what might lead to such a change in the number of reports?
  - The injury and fatality rate for general aviation traffic is significantly higher than the rate for commercial aviation. Why do you think this is so?
  - Of the various rates shown, which is potentially the most volatile (most subject to change)? Why?
  - Name at least two different factors that might be helping to reduce the number of injuries and fatalities for car travel. Explain the rationale for your answers.

## Grading Rubric

This assignment is worth 50 points. It will be graded by your instructor using this rubric, with partial credit awarded as appropriate:

Steps 3a-d	1.5 points total	Steps 9a-b	1.5 points total
Step 4	3 points	Steps 10a-c	4.5 points total
Steps 5a-g	3.5 points total	Step 11	3 points
Step 5h	2.5 points	Step 12a	4 points
Steps 6a-f	3 points total	Step 12b	3 points
Steps 7a-d	3 points total	Steps 13a-f	3 points total
Steps 8a-b	4.5 points total	Steps 14a-e (pick 4 of 5)	2.5 points each

The analysis questions in Steps 14a-e will be evaluated using this rubric:

Standard	Meets Requirements (1.25 points)	Does Not Meet Requirements (0 points)
Answer is reasonable.	Answer addresses the question prompt and is factually correct or a reasonable interpretation of available data.	Answer does not address the question prompt, is factually incorrect, or is an unreasonable interpretation of available data.
Answer is supported.	Logical rationale is provided to support the given answer.	Logical rationale is not provided to support the given answer.

## Acknowledgments

The image in the introduction appears courtesy of Dave's EMS Headquarters [2].



# Homework #2

## Safest Mode of Travel Problem

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### References

- [1] "National Transportation Statistics," U.S. Department of Transportation.  
Available:  
[http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/national\\_transportation\\_statistics/index.html](http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/national_transportation_statistics/index.html).
- [2] United Airlines Flight 232. 1989. Available:  
<http://www.davesems.com/files/232crash-89.jpg>.