**Wildfires vs. Cars Excel Graphing Exploration Directions Sheet**

*DIRECTIONS*: Students will analyze data for both forest fires and cars using Excel. After making the graphs, students will determine which releases more CO2, wildfires or cars. Sheet 1 looks at forest fire data, and Sheet 2 investigates vehicle data.

**SHEET 1: Forest Fire Data:** <https://www.nifc.gov/fire-information/statistics/wildfires>

MATH REVIEW: Think critically about the **units** in this analysis.

For example: 4,578 miles/gal \* 33 gal = \_\_\_\_\_\_\_\_\_\_\_\_\_

 $\frac{4,578 miles}{gal } ×33 gal$ (Notice that the gallons cancel, so your answer will be in miles!)

***Step 1*.** Create a line graph showing the number of fires burned by year. Highlight both columns using the shift key and down arrow, then click on INSERT, chart, recommend. Choose a line graph. Put the graph in the STEP 1 BOX. Answer the question.

 **HOW to TITLE and LABEL the graph in EXCEL:**

1. Click on the graph, then click on the +.
2. Turn on the Axis Titles and the Chart Title.
3. Rename both the title and labels to fit your information.

***Step 2.*** In column D, calculate the **number of square miles burned/ # of fire** by year.

*How to write a formula in Excel*:

1. Label column D **Sq. Miles/# of Fires.**
2. Click on the first cell underneath.
3. When writing formulas, they must have both an equal sign AND parentheses, e.g., **=(Sq. Miles/# of Fires)**
4. ***=(click on first number in column C /click first number in column B)****.*
5. Click on box D1 (where you see a number) and drag down to apply to entire column.

***Step 3.*** Make a line graph using the column you just created by year.

1. Click on column A (YEAR), hold shift, and move the arrow to the right side of the column and drag it next to the column you just created.
2. Highlight both **Year** and **Sq Miles/# of Fires**, insert, recommend, and choose a line graph.
3. Title and label the axes (see box above).
4. Answer the conclusion question.

**An estimate of the CO2 released by a forest fire is between 3,125 kg and 12,500 kg per sq. mile burned.**

***Step 4*.** In column E, calculate the kg of *CO2 emitted using the lower bound* of the estimate using the following formula:

1. Label column E **Lower Bound CO2**.
2. Write the formula **=(sq. miles \* 3125 kg/sq. mile)**

\*Also, what happened to the sq. miles when you multiplied? \_\_\_\_\_\_\_\_\_\_\_\_\_

1. Drag down to fill the entire column.

***Step 5*.** In column F, calculate the kg *CO2 emitted using the upper bound* of the estimate using the following formula:

1. Label column F **Upper Bound CO2**.
2. Write the formula **=(sq. miles \* 12500 kg/sq. mile)**.
3. Drag down to fill the entire column.

***Step 6*. Drag the Year column next to the columns you just made.** Make one LINE graph showing the estimated range of CO2 emitted from forest fires by year by highlighting all three columns. Title and label the axes. **Answer the conclusion question**.

**SHEET 2: U.S. Highway Vehicle Miles**: <https://www.bts.gov/content/us-vehicle-miles>

**MPG data**: https://www.epa.gov/automotive-trends/explore-automotive-trends-data

In this exploration we will use the following estimate:

 *A vehicle emits 8.887 kg of CO2 for every gallon of fuel burned.*

**Column C:** The reciprocal of miles per gallon (mpg) is gallons per mile (gpm).

**Column D:** Millions of U.S. highway miles in millions.

**Column E:** U.S. highway miles in trillions (million x million). This is a very large number, so you will see 2.96479E+12, which is the same as writing 2.96479 x 1012 OR 2,964,790,000,000.

**Step 1.** Make one LINE graph showing the MPG vs. year. Answer the conclusion question.

1. Click shift and down arrow to highlight both columns.
2. Insert, recommend, choose a line graph.
3. Title and label the axes (see box on Page 1).

**Step 2.** Make one line graph showing U.S. highway miles (trillions) vs. year.

1. Drag the years column next to the trillion miles column.
2. Highlight both columns and create a line graph.

**Step 3.** Label **Number of Gallons of Fuel consumed** on **column F**. Estimate the number of gallons of fuel consumed using the formula:

**=(GPM)\*(miles in trillions)**

\*Remember $\frac{gallons}{mile }$ X miles = \_\_\_\_\_\_\_\_\_\_ (What happens to the miles? What do we label this number?)

You are NOT making a graph for this step; your answer will be used to make a line graph in Step 4.

**Step 4.** Label column G **Kg of CO2**, and estimate the kg of CO2 emitted by U.S. highway miles using the following formula:

**=(trillions of gallons)\*(8.887 kg CO2/gallon)**

\*Remember $gallons X \frac{8.887 kg CO2}{gallons}$ = \_\_\_\_\_\_\_\_\_ (what happens to the gallons? What do we label this number?)

Drag the Year column next to column G. Highlight both columns and create a line graph. Title and label the axes. Answer the conclusion questions.