Name: **Date:** **Class:**

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 CO_2, 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 = _____

$\frac{4{,}578\ miles}{gal} \times 33\ gal$ (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:

a. Click on the graph, then click on the +.
b. Turn on the Axis Titles and the Chart Title.
c. 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 CO_2 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 *CO_2 emitted using the lower bound* of the estimate using the following formula:

1. Label column E **Lower Bound CO_2.**
2. Write the formula **=(sq. miles * 3125 kg/sq. mile)**

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

3. Drag down to fill the entire column.

Step 5. In column F, calculate the kg *CO_2 emitted using the upper bound* of the estimate using the following formula:

1. Label column F **Upper Bound CO_2**.
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 CO_2 emitted from forest fires by year by highlighting all three columns. Title and label the axes. **Answer the conclusion question**.

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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 CO_2 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 10^{12} 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 CO_2**, and estimate the kg of CO_2 emitted by U.S. highway miles using the following formula:

=(trillions of gallons)*(8.887 kg CO_2/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.