

Name:

Date:

Class:

CO₂ Activity Worksheet

For this activity, you need the *CO2-case-study-data.xls* file, which is available from your teacher. Begin by opening this document in Excel or Google Sheets. Then work either individually or in groups to complete this worksheet. Remember to use the *Excel Reference Sheet* for help.

Background Information: This data was collected in Paonia, CO, one data set from January and one from April. Both data sets include four days of minute-averaged data—in other words, each data point is the average of all data recorded during that minute.

1. Develop a **hypothesis** that explains how you expect the CO₂ data to differ in the two months, and why. (*For example, do you expect one month to be higher?*) Record your hypothesis below.
(*Hint: Think about different sources and sinks of carbon dioxide and how the time of year might affect these.*)

Data Statistics

1. Calculate the following using Excel (*use Table 1 on the Excel sheet*):

	January	April
Mean (ppm)		
Median (ppm)		
Standard deviation (ppm)		

2. Create a **bar graph** of the data from Table 1. (*Hint: Highlight the entire table, then click “insert,” then choose the “column chart.”*) Place the chart in the allocated space; label the axes and chart title.
3. Below, list two observations regarding these statistics.

Visualizing the Data in Time

1. Make a **time series** of the data. Use the “Index Minute” values for the x-axis values and the CO₂ data from the y-axis data, which lets you overlay both data sets on one graph. Also, choose the “scatter with smooth lines” option. Place the chart in the allocated space; label the axes and chart title.
2. List one similarity between the two data sets. (*Hint: Are there any patterns?*)
3. List one difference between the two data sets.

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Examining Relationships in the Data

1. Make 2 *scatter plots* of temperature vs. CO₂, one for the January data and one for the April data. Plot temperature on the x-axis and CO₂ on the y-axis. Place the charts in the allocated space; label the axes and chart titles.
2. Do you see a relationship between CO₂ concentrations and temperature? Is the relationship stronger for one month or the other? If so, which one?
3. Fit a linear relationship to each scatterplot and find the R² value. Do the R² values confirm your answer to the previous question? YES No If not, check your values.

R² for January = _____ R² for April = _____

Final Conclusions

1. *Complete the following:* CO₂ concentrations in January are generally _____ than April.
This means that CO₂ appears to be greater in the _____ season.
2. Based on your analysis, was your hypothesis correct? If not, explain where your analysis and your hypothesis conflict.
3. **Putting it all together:** Temperature does not control CO₂, so why do we see a correlation? Give two explanations for seasonal differences in CO₂ concentrations (*Hint: Again, think about CO₂ sources and sinks, how these vary seasonally, and how they explain your analysis.*)