# Linear Regression Project

## General Information

**Summary:** Gather data and graphically and mathematically analyze them in a formal analytical paper.

**Group Work:** You may discuss your project with others, but all writing, graphs, etc. must be entirely your own work. Your paper may not be graded if any other student sees it before turning his or hers in.

**Due:** Thursday, April 20, on the green table no later than 1:30. If you are late or absent this day, email a copy of your paper to ewyner@scottsvalleyusd.org before the start of class, and turn in an identical hard copy with a readmit slip when you return.

**Early Submission:** If you would like, turn in a completed draft of your paper on or before April 13. It will be returned, with feedback, in time for you to make changes and resubmit your paper by the due date.

## Directions

### Part I: Predictions

1. Choose a concept (your dependent variable) that can be made measurable and that you feel is valuable to study.

2. Establish a numerically measurable operational definition of the concept you chose.

3. Consider two or more numerically measurable concepts (independent variables) that might affect your dependent variable. Make sure you have ample justification why these variables may in fact influence it.

4. Get signed approval on the back of this page for your choice of variables.

### Part II: Data

5. Collect 12 or more data points for your dependent variable. If your data are from a website, make sure the source is reasonably official and trustworthy, and cite it. If you collect your own data by hand, describe the exact procedure used to collect the data, and include, as an appendix, a copy of any forms used.

6. Repeat step 5 for one of the independent variables identified in step 3.

7. Make a scatterplot and line of best fit for your data from steps 5 and 6.

8. Do a statistical test on your data from steps 5 and 6.

9. Repeat steps 5-8 for each additional independent variable in step 3.

### Part III: Paper

10. Write an introduction, in which you introduce the topic and explain why it is important socially or otherwise. In particular, discuss why it would be valuable to know what affects the dependent variable.

11. Write a method section, in which you explain exactly how you collected your data. Include any details about the sources that could be relevant, including a description of the types of people who provided data to you, or citation and description of any secondary data sources used. Precisely define each variable.

12. Write a results section, in which you state the correlation coefficients, $p$ values, and statistical conclusions, and display the graphs. Comment on how well these support your predictions.

13. Write a discussion section, in which you discuss the meaning, conclusiveness, and implications of your findings:

    - What do your findings actually mean? Be careful to avoid implying causation. You will likely be able to say that two or more variables are correlated, meaning they vary together and can be used to predict each other to some extent, but only able to make guesses about why this relationship exists, rather than concluding that the independent variable affects the dependent variable.

    - How conclusive are your findings? Consider three factors: a) statistical significance—is $p$ lower than .05? b) practical significance—is $r$ big enough to care about? c) validity—how likely is it that your results actually mean what you interpret them to mean, as opposed to there being an alternative explanation due to confounding variables? Discuss alternative explanations critically.

    - What are the implications of your findings in a real-world context? Do they provide any advice for individuals or societies? Do they lead you to consider other variables to study that may affect your independent variable, or possibly a way to test if there is actually a causal relationship between the variables?

14. Proofread your paper so that it could be turned in as a paper in English class.

15. Score yourself on the back by checking the "yes" box, the "somewhat" box, or neither, for each item. The purpose of this is for you to make sure you are not leaving anything out. Your scoring does not need to be perfect, but you may be graded down if it clearly does not represent your paper.

16. Attach this sheet to the back of your paper. Put your name on it but not on your paper.

|               | Dependent Variable: | Independent Variables: |
|---|---|---|
| *yes*  *somewhat* | Approval: | Name: |

**[A]  Communication: \_\_\_\_\_/10**

*The paper is coherent, well organized, concise, and complete.*

☐ ☐  The introduction draws in the reader.

☐ ☐  There are no incomplete or run-on sentences.

☐ ☐  There are few, if any, typos or errors in punctuation, grammar, or spelling.

☐ ☐  The paper is appropriately divided into paragraphs, each of which flows easily to the next.

☐ ☐  The paper is well written and could be turned in for a good grade as an English assignment.

**[B]  Mathematical Presentation: \_\_\_\_\_/10**

*The mathematical presentation is appropriate throughout.*

☐ ☐  Mathematical terminology is used appropriately.

☐ ☐  Mathematical notation is correct as if from a textbook; in particular, variables are italicized and numbers and symbols are not.

☐ ☐  Graphs are appropriately positioned within the essay to illustrate the written ideas.

☐ ☐  Graphs are appropriate in all respects, including scales.

☐ ☐  Graphs clearly convey all information; in particular, they have relevant titles and appropriately labeled axes.

**[C]  Use of Mathematics: \_\_\_\_\_/10**

*Relevant mathematics commensurate with the level of the course is used. The mathematics explored is precise and reflects the sophistication and rigor expected. Thorough knowledge and understanding are demonstrated.*

☐ ☐  Appropriate data are used.

☐ ☐  Calculations are accurate.

☐ ☐  Any unreasonable results are identified as such.

☐ ☐  The paper conveys an understanding of the mathematical processes involved.

☐ ☐  There is a careful analysis of the validity of the mathematical processes used in the context of this particular project.

**[D]  Reflection: \_\_\_\_\_/10**

*There is substantial evidence of critical reflection.*

☐ ☐  The introduction conveys the importance of the topic.

☐ ☐  Reasonable possible explanations for the findings are provided.

☐ ☐  The possible explanations are discussed critically.

☐ ☐  Statements of certainty are not made where not appropriate.

☐ ☐  The real-world implications of the findings are discussed.

**[E]  Graphs Included: \_\_\_\_\_/10**

*At least two graphs are included.*

**[F]  Bonus: \_\_\_\_\_/0**

☐ +5  The final paper is turned in on to the green table at least two days early.

☐ +2  This page is appropriately filled out and attached to the back of your paper.

☐ +2  Your name is written on this page but not on the paper itself.

**Total Score: \_\_\_\_\_/50**