

Lab 10 – MATH 240 – Computational Statistics

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Abstract

This document provides a basic template for the 2-page labs we will complete each week. Here, briefly summarize what you did and why it might be helpful. Provide all the top-line conclusions, but avoid providing *all* the details. Results should be limited to “we show X, Y, and Z.”

Keywords: What topics does the lab cover concerning class? List 3-4 key terms here, separated by semicolons.

1 Introduction

Gallup polls published a document called “*How Are Polls Conducted?*” that describes how Gallup selects people to include in its poll and other details. Gallup states towards the end of the document:

“For example, with a sample size of 1,000 national adults (derived using careful random selection procedures), the results are highly likely to be accurate within a margin of error of ± 4 percentage points.”

“If Gallup increases a poll sample size to 2,000, the results would then be accurate within ± 2 of the underlying population value, a gain of two percentage points in terms of accuracy, but with a 100% increase in the cost of conducting the survey.”

In a study from February 3-16, 2025 poll of 1,004 adults aged 18+ living in all 50 U.S. states and the District of Columbia showed that only 39% of Americans were satisfied with the United States’s position in the world, whereas 59% of people were dissatisfied. Note: 2% had no opinion on the United States’s position. Gallup reported the $\pm 4\%$ margin of error.

Through this lab, we aim to study how larger sample sizes lead to lowering the margin of error. Margin of error is a measure which aims to describe the variation in our using the sample proportion \hat{p} as an estimate of p . The measure aims to tell us how much the sample proportion to differ from the proportion for the entire population.

Statisticians and quantitative researchers aim to report their studies with a 95% confidence.

1.1 Intro Subsection

You might need/want to discuss the topics in subsections. Or, you may have multiple questions.

2 Methods

Describe the data you are working with, if applicable. Describe the specific process you will follow to answer the question at hand. This does not mean you should write something like this.

I did this and then I did that and then I did this other thing and then..., and then..., and then...

Instead, it should provide a clear and concise narrative that flows from the problem specification in the Introduction to how you will approach answering it. This is where I would expect to see some citations for R packages you will use to conduct the statistical analysis reported in the Results section.

2.1 Methods Subsection

Much like the Introduction, subsections can be helpful for the Methods section. For example, you might describe data collection and the statistical analyses of the collected data in different subsections. Or, you may have different questions that require distinct methods.

3 Results

Tie together the Introduction – where you introduce the problem at hand – and the methods – what you propose to do to answer the question. Present your data, the results of your analyses, and how each reported aspect contributes to answering the question. This section should include table(s), statistic(s), and graphical displays. Make sure to put the results in a sensible order and that each result contributes a logical and developed solution. It should not just be a list. Avoid being repetitive.

3.1 Results Subsection

Subsections can be helpful for the Results section, too. This can be particularly helpful if you have different questions to answer.

4 Discussion

You should objectively evaluate the evidence you found in the data. Do not embellish or wish-terpet (my made-up phrase for making an interpretation you, or the researcher, wants to be true without the data *actually* supporting it). Connect your findings to the existing information you provided in the Introduction.

Finally, provide some concluding remarks that tie together the entire paper. Think of the last part of the results as abstract-like. Tell the reader what they just consumed – what’s the takeaway message?

Bibliography: Note that when you add citations to your bib.bib file *and* you cite them in your document, the bibliography section will automatically populate here.

5 Appendix

If you have anything extra, you can add it here in the appendix. This can include images or tables that don't work well in the two-page setup, code snippets you might want to share, etc.