

Guided Thought Questions

MATH 322: Mathematical Statistics II
Learning Module 3: Hypothesis Testing

All textbooks are written at two cognitive levels. The surface level is the literal information provided in the book. The deeper level is the connections between the topics. Textbooks are excellent at the surface level, rarely good at the deeper level. To help with the deeper levels, I am providing several questions for each section of the textbook.

You should take time to answer these questions after reading the section. Answer them in your notes. Make sure that you are able to confidently answer them. In fact, you should feel pressure to ask these questions in class if you cannot answer them.

Readings: Sections 6.1 to 6.5

§1: Introduction

1. What is the relationship between a confidence interval and a rejection region?
2. Why does the null hypothesis and the alternative hypothesis need to be logical opposites?
3. Why do we focus on the Type I error rate in statistics, instead of the Type II error rate?
4. What effect does the sample size have on the Type I and Type II error rates?
5. What does a power curve tell us?

§2: The Neyman-Pearson Lemma

1. Why is this important result called a Lemma?
2. Why would we want a “most powerful” test?
3. If $\alpha = 0.50$, then what is K ?
4. Why is the Neyman-Pearson Lemma interesting, but not really helpful for real hypotheses?

§3: Likelihood Ratio Tests

1. How does one calculate the likelihood? Why is the likelihood not a probability?
2. How is the Likelihood Ratio test similar to a Neyman-Pearson test?

§4: Hypotheses for a Single Parameter

1. What does the p-value measure?
2. How is a p-value related to the null hypothesis?
3. How is the p-value related to the confidence interval?
4. Would a pivotal quantity make calculating p-values easier?

§5: Testing Hypotheses for Two Samples

1. How can we determine if two samples are dependent or independent?
2. What is Smith and Satterthwaite known for?
3. Why does it seem as though most of hypothesis testing is just a repeat of confidence intervals?