Lecture 13

STAT 109: Introductory Biostatistics

Lecture 13: ESP Worksheet — Binomial Test in Practice

Follow the steps below to conduct your own ESP test, compute your p-value in R, and share your results with the class. This follows the same structure as the sample project in Lecture 12.

Step 1: State your null and alternative hypotheses (ESP)

You are testing whether you have ESP using the same setup as my test in Lecture 12.

- Let p = the probability that **you** correctly predict the symbol on a single trial.
- If you don't have ESP, you're guessing among 5 symbols, so $p = 0.2$. If you do have ESP, $p > 0.2$.

Your turn. Write the null and alternative hypotheses and double check that they are identical to the ones I wrote in Lecture 12:

H_0:

H_a:

Step 2: Verify the 4 conditions of a Binomial Random Process (in context)

Before we treat the number of correct guesses as a binomial random variable, we need to check that the 4 BRP conditions hold for this data collection.

Your turn. In the context of the online ESP test (25 attempts, 5 symbols, open deck, cards seen), briefly think through why each condition is satisfied:

1. **Binary outcome:** Each trial has only two outcomes. Why? (What are they?)
2. **Fixed number of trials:** What is n? How do we know it's fixed?
3. **Fixed probability of success:** Under the null hypothesis that you are guessing, what is the value of p on each trial? Why doesn't it change from trial to trial in the "open deck" setup?
4. **Independent trials:** Why doesn't one guess affect the next? Of if you believe guesses are not independent, what could you do to collect data in a way that your guess on one attempt doesn't affect your guess on another attempt?

Step 3: Identify n and p (under the null)

Your turn. For this activity we will all use 25 attempts. If the null hypothesis is true that **you** don't have ESP then

- $n =$
- $p =$

Step 4: Collect your data — take the ESP test

1. Go to the **Advanced ESP (Zener Cards) test**: https://psychicscience.org/esp3.
2. Watch the ad to access the test for "free",
3. Use the default options: **Clairvoyance**, **Open deck**, **Cards seen**, **25 cards**.
4. Complete all 25 guesses.
5. Record your **number of correct predictions** (this is your observed value of x).

Your x (number of correct predictions out of 25):

Step 5: Find your p-value using the sample R notebook

1. Open the sample Colab notebook: **Lecture 12 — Binomial Test (R code)**.
2. In the notebook, find where I put my observed number of correct predictions (my value x from Lecture 12 is **4**).
3. **Change all the values of** x **from 4 to your value of** x (from Step 4).
4. **Run all the code** in the notebook (e.g., Runtime → Run all, or run each cell in order).
5. Find the **p-value** reported by the notebook and record it.

Your p-value:

Step 6: Post your results on Canvas

Go to the **Canvas discussion thread** for this activity.

Post the following:

- Your x (number of correct predictions out of 25).
- Your **p-value**.

We'll see who in class is **least consistent** with the hypothesis of no ESP by seeing who has the **smallest p-value** (or equivalently, the **largest** x). This will be the person who is most likely to have ESP!