Lab 5

STAT 109: Introductory Biostatistics

Lab 5: Project 1 Precheck — Hypotheses and Binomial Graph

This lab walks you through the planning steps for **Project 1**. You will state your research question, define p in context, write your null and alternative hypotheses, and create the **graph of the binomial distribution** you will use in your project. This is a **precheck**: you don't need to have collecting data yet; you are just locking in your question, hypotheses, and the updating values of n and p for the R code from Lecture 12 and 13.

What you will turn in: Your research question, a sentence stating what p represents in context, the direction of your best guess for p (your alternative hypothesis), and your **graph of the binomial distribution** (using your n and p).

Step 1: Your research question

From Project 1, you chose a **Binomial Random Process** you can observe (with $n = 25$ trials). It must satisfy the four BRP conditions, and it must **not** be a class example (e.g., not coin tosses or ESP).

Your turn. In one or two sentences, state the **research question** you are trying to answer with your process.

My research question:

Step 2: What is p in your context?

The parameter p is the **probability of a "success" on a single trial** in your process. For your project, "success" might mean a correct guess, a "yes" response, a left turn, etc. — it depends on your question.

Your turn. Write **one sentence** that states what p represents in your context (in words, for a reader who doesn't know your study).

p in context:

Step 3: Null and alternative hypotheses (conventional notation)

Before observing data, you made a best guess about whether p is larger than, smaller than, or not equal to some number. That guess is your **alternative hypothesis** (H_a). The **null hypothesis** (H_0) is the equality that goes with it.

Your turn. Write your null and alternative hypotheses in conventional notation. Use the **same number** for p in both (the value under the null).

H_0: $p =$

H_a: p (choose one: $>$, $<$, $\neq$)

Step 4: Values of n and p for the R code

The R code in the Lecture 12 / Lecture 13 Colab notebook builds the binomial distribution and plot using n (number of trials) and p (probability of success under the null).

Your turn. From your process and H_0, identify the values you will use in the notebook:

- $n =$ (Project 1 uses $n = 25$ trials.)
- $p =$ (Use the number that appears in H_0.)

Step 5: Create your binomial graph in R

1. Open the **Lecture 12 — Binomial Test (R code)** Colab notebook (same one used in Lectures 12 and 13).
2. In the notebook, find where n and p are set (in the lecture example they are $n = 25$ and $p = 0.2$).
3. **Change** those to **your** values of n and p from Step 4.
4. **Run all the code** so that the notebook produces the bar plot of the binomial distribution (the graph of $P(X = x)$ for $x = 0, 1, \ldots, n$).
5. **Export or save** that graph so you can turn it in (e.g., screenshot or download from Colab).

You will update this same graph later for your Project 1 report; for the precheck you only need to submit this graph with your n and p.

What to turn in for Lab 5, Precheck for Project 1

Submit the following in a word or google document to Canvas by Midnight on Tuesday, Feb. 24th:

1. **Research question** — The question you wrote in Step 1.
2. **What** p represents — The one-sentence description of p in context from Step 2.
3. **Direction of your best guess (alternative)** — Your H_a in words or in notation (e.g., "$p > 0.5$" or "I think p is greater than 0.5").
4. **Your binomial graph** — The bar plot of the binomial distribution from Step 5 (using your n and p).

This precheck confirms your question, parameter, hypotheses, and graph before you add your data and write the full Project 1 report.