

Lab. 2: Chapter 3, R and distributional theory

R and distributions.

Objectives:

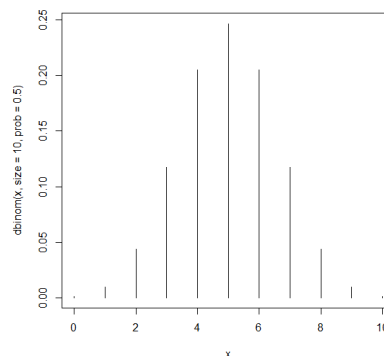
- Learn discrete distributions
- Calculate probabilities and create samples
- Make plots of various kinds using the base and ggplot2 packages

Output:

- Make an Rmd document for this lab
- At the conclusion render into the 3 file types
- Upload the 4 files to the server.

Tasks:

1. The Binomial distribution. Throw a coin “n” times and the number of successes is “x”. Where p = probability of a success
 - a. Write the formula for $p(X = x|n, p)$ using Latex
 - b. Using the answer to the above write your own r function `dmybin()` to calculate $p(X = x|n, p)$ record this in Rmd
 - c. Now calculate $p(X = 4|n = 10, p = 0.5)$ using your function
 - d. Use the built in R function `dbinom()` to calculate the same probability.
 - e. What if we wish to calculate the cumulative probability $p(X \leq x|n, p)$, we would need to sum individual probabilities. Make a function called `pmybin()` that would do the job.
 - f. Use the function to calculate $p(X \leq 5|n = 10, p = 0.5)$
 - g. Use the built in R function `pbinom()` to do the same and see whether the answers are the same.
 - h. Make the following plot, where $n=10, p=0.5$ except put your name on the title:



2. Learn how to use the four basic distributional functions

dstem, pstem, rstem, qstem

- a. Suppose that $X \sim \text{Pois}(\lambda)$. Use R and the above function types to answer the following.
 - i. Find $P(X = 4 | \lambda = 3)$
 - ii. Find $P(X \leq 4 | \lambda = 3)$
 - iii. Find $P(X > 4 | \lambda = 3)$
 - iv. Find x so that $P(X \leq x | \lambda = 3) = 0.9997077$
 - v. Create a sample of size 100 from a Poisson distribution that has parameter $\lambda = 3$. Store in an object.
 - vi. Make a second sample of size 100 from a Poisson that has parameter $\lambda = 6$, store in an object
- b. Make boxplots of the random samples you made above.
 - i. We will make a data frame of the data. Call the first group "Fst" and the second group "Snd". All data in the first group have to have "Fst" associated with them etc.
 - ii. See Laboratory2.R for some exemplar code using ggplot
- c. Make violin plots of the same using ggplot