

I. **Sections to Read** (All content from DeGroot and Schervish's *Probability and Statistics* unless otherwise noted) A digital copy of the textbook is available for on our class PWeb site, under the Day One Access tab.

(a) Section 8.7 (note we are briefly jumping ahead to Chapter 8 before returning to Chapter 7)

II. **Objectives** (By the end of the day's class, students should be able to do the following:)

- Define the bias of an estimator $\delta(\mathbf{X})$ for a parameter θ .
- Determine whether a given estimator is unbiased
- Explain how bias and variance relate to the mean squared error of an estimator
- Discuss some limitations of unbiased estimators

III. **Reflection Questions** (Submit answers on Gradescope <https://www.gradescope.com>)

- 1) True or false? The bias of an estimator $\delta(\mathbf{X})$ for a parameter θ will be a function of the data $\mathbf{X}$.
- 2) Suppose $X_1, \dots, X_n$ are iid $N(\mu, 1)$. Explain why the estimator $\delta(\mathbf{X}) = \bar{X} = \frac{X_1 + \dots + X_n}{n}$ is an unbiased estimator of μ . What is the Mean Squared Error of this estimator?
- 3) Briefly explain one reason you might choose to use a biased estimator, instead of an unbiased one, in order to estimate a parameter θ .

IV. **Additional Feedback** Are there any topics you would like further clarification about? Do you have any additional questions based on the readings / videos? *If not, you may leave this section blank.*