

Suggested readings and practice problems from [OpenIntro Statistics, 3rd edition](#) (a free online introductory statistics textbook co-authored by Dr. Cetinkaya-Rundel) for this week:

**Suggested reading:** *OpenIntro Statistics*, 3rd edition, Chapter 4, Section 4.1, 4.2

**Suggested exercises:** (End of chapter exercises from *OpenIntro Statistics*)

- Variability in estimates and the Central Limit Theorem: 4.1, 4.3, 4.5, 4.33, 4.35, 4.37, 4.41
- Confidence intervals: 4.9, 4.11, 4.13, 4.15

(Reminder: the solutions to the end of chapter exercises are at the end of the *OpenIntro Statistics* book)

**Test yourself:**

1. For each of the following situations, state whether the variable is categorical or numerical, and whether the parameter of interest is a mean or a proportion.

- In a survey, college students are asked whether they agree with their parents' political ideology.
- In a survey, college students are asked what percentage of their non-class time they spend studying.

2. Suppose heights of all women in the US have a mean of 63.7 inches, and a random sample of 100 women's heights yield a sample mean of 65.2 inches. Which one is the population parameter and which one is the point estimate? Which one is  $\mu$  and which one is  $\bar{x}$ ?

3. Suppose heights of all women in the US have a standard deviation of 2.7 inches, and a random sample of 100 women's heights yields a standard deviation of 4 inches. Which one is the population parameter and which one is the point estimate? Which one is  $\sigma$  and which one is  $s$ ?

4. Explain, in plain English, what is going on in Figure 4.8 of the book (page 166).

5. List the conditions necessary for the CLT to hold. Make sure to list alternative conditions for when we know the population distribution is normal vs. when we don't know what the population distribution is, and when the sample size is barely over 30 vs. when it's very large.

6. Confirm that  $z^*$  for a 98% confidence level is 2.33. (Include a sketch of the normal curve in your response.)

7. Calculate a 95% confidence interval for the average height of US women using a random sample of 100 women where the sample mean is 63 inches and the sample standard deviation is 3 inches, and interpret this interval in context of the data.

8 Explain, in plain English, the difference between standard error and margin of error.

9. A little more challenging: Suppose heights of all men in the US have a mean of 69.1 inches and a standard deviation of 2.9 inches. What is the probability that a random sample of 100 men will yield a sample average less than 70 inches? (Hint: First check if we should expect the sample mean to be distributed nearly normally, i.e. if the CLT holds. If so, sketch a normal curve with mean  $\mu$  and the appropriate standard error. Shade the area you're

*interested in, and calculate it using methods we learned in the previous unit.)*