

# MATH 11: Discussion Week 7

May 2019

Handout and its solution could be found at <https://kimukook.github.io/teaching/math11sp19/>

**Mean and variance:** 1. A company sells computer chips in packages of 100. They estimate that the average number of computer chips per package that will work is 90 with a standard deviation of 3 chips. **Five** separate packages are randomly selected for quality control.

(4mins) (a) How many nonfunctional computer chips do you expect to find in total of those five packs?

(4mins) (b) What is the standard deviation of the number of nonfunctional computer chips found? (Assume independence for the number of nonfunctional chips.)

**Sampling Distribution** 2. A friend tells you that the average weight of American men is 191 pounds with a standard deviation of 23 pounds. Doubting this, you decide to draw a simple random sample of 300 American men and calculate the average. What is the probability you get an average less than 188 pounds? You do not need to check the conditions that we typically do for a problem like this. (*Hint:  $P(Z \leq -2.26) = 0.0119$ .*)

## Confidence Intervals:

Some concepts: **Standard error:**  $SE(\hat{p}) = \sqrt{\frac{\hat{p}\hat{q}}{n}}$ . **Margin of error:**  $ME = z^* \cdot SE(\hat{p})$ .

3. To approximate the percentage of people who self-identify as LGBT in Tokyo, we sample 800 volunteers from a local mall. Of these, 31 identify as LGBT.

(a) Find an 80% confidence interval for the true proportion of LGBT self-identifiers in Tokyo. (You do not need to check the conditions that we typically do for a problem like this.) (*Hint: For 80% confidence interval,  $z^* = 1.28$ .*)

(b) If we want to cut our margin of error in half (staying with 80% confidence), how large must the sample be? Provide some reasoning why your answer cuts the margin of error in half.

4. Suppose an investigator asked 510 randomly sampled adults the question about whether or not the death penalty is fair. Of these, 58% answered "Fairly", 42% said "Unfairly".

(3mins)(a). Find the 95% interval to contain the true proportion  $p$ , of adults who think the death penalty is applied fairly. (Remember to check for conditions.) (*Hint: Think about where does 1.96 come from, i.e.  $P(z \leq 1.96) = 97.5\%$ .*)

(3mins) (b). If we want to have a 2% margin of error(ME), how many adults should we choose in a new sample?

(3mins) (c). How to interpret this 95% interval?

(3mins) (d). Find the 80% confidence interval to contain the true proportion  $p$ . Remind that  $P(z \leq 1.28) = 90\%$