

Wednesday, April 15: Using the CLT

Group Members: List the names of your group mates below.

For each problem, check whether the three conditions are satisfied for the Central Limit Theorem. If so, explain what this tells you about the sampling distribution and use this fact to determine the probability.

1. Of the 691 students enrolled at Guttman in Fall 2014, 30% of them live in the Bronx (see <http://guttman.cuny.edu/about/fastfacts.html> for this and other “Fast Facts” about Guttman.)

You ask a simple random sample of 40 Guttman students if they are from the Bronx.

- a) Is condition 1 satisfied? *Why or why not?*
- b) Is condition 2 satisfied? *Why or why not?*
- c) Is condition 3 satisfied? *Why or why not?*
- d) If any one of the three conditions was **not** satisfied then skip to problem 2. Otherwise, calculate the standard error:

$$SE = \sqrt{\frac{p(1-p)}{n}} =$$

- e) Fill in the missing information in the following sentence.

*The sample was randomly selected. We would expect _____ > 10 students in the sample to be from the Bronx and _____ > 10 students to ***not*** be from the Bronx. The population of 691 students was at least _____ times the size of the sample. Therefore, the Central Limit Theorem tells us that the sampling distribution is approximately a _____ distribution with mean _____ and standard deviation _____.*

- f) What is the probability that 15% or less of the sample will be from the Bronx?

2. Of the 691 students enrolled at Guttman in Fall 2014, 48% were under the age of 19.

You ask a simple random sample of 15 Guttman students if they are under 19 years of age.

- a) Is condition 1 satisfied? *Why or why not?*

- b) Is condition 2 satisfied? *Why or why not?*

- c) Is condition 3 satisfied? *Why or why not?*

- d) If any one of the three conditions was **not** satisfied then skip to problem 3. Otherwise, calculate the standard error:

$$SE = \sqrt{\frac{p(1-p)}{n}} =$$

- e) Fill in the missing information in the following sentence.

The sample was randomly selected. We would expect _____ > 10 students in the sample to be under 19 years of age and _____ > 10 students to be older than 19. The population of 691 students was at least _____ times the size of the sample. Therefore, the Central Limit Theorem tells us that the sampling distribution is approximately a _____ distribution with mean _____ and standard deviation _____.

- f) What is the probability that 65% or more of the sample will be younger than 19?

3. How big would the sample in problem 2 need to be in order for the Central Limit Theorem to work? **Explain** your answer.

6. A restaurant owner anticipates serving about 180 customers on a Saturday evening. Based on past data about 15% of the customers will order the strip steak special. How many strip steaks should he thaw to be pretty sure of having enough thawed steaks on hand to meet the customer demand. Justify your answer, including an explanation of what “pretty sure” means to you. Make sure you *explain* how you used the Central Limit Theorem to answer this question.

7. You have randomly sent out 4000 invitations to people living in Manhattan to hear a speaker and you must rent chairs for the people who come. In the past usually about 8% of the people invited have come to hear the speaker. You decide to rent enough chairs so that if 8.5% of the people (340 people) show up you will have enough chairs. What is the probability that you will not have enough chairs for all the people who attend? Make sure you *explain* how you used the Central Limit Theorem to answer this question.