Problem Set Section 2C

Directions: Answer the following questions about sample size requirements and the shape of sampling distributions.

1. Why is it important for a sampling distribution for sample means or sample proportions to be normal?

2. What conditions should be met to insure that a sampling distribution of sample proportions is normal?

3. State the Central Limit Theorem and explain the ideas behind it.

4. Suppose the population is not normal. If we increase the sample size, what will happen to the standard error and the shape of the sampling distribution of sample means?

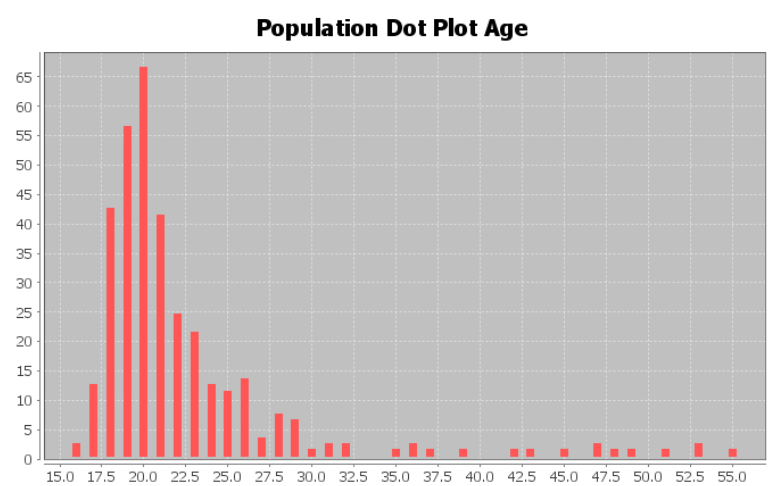
5. Suppose the population is not normal. If we decrease the sample size, what will happen to the standard error and the shape of the sampling distribution of sample means?

6. Suppose the population is not normal. What conditions should be met in order to insure that a sampling distribution of sample means is normal?

7. If the population is normal, will the sampling distribution for sample means look normal for very small sample sizes?

8. Median averages, variance and standard deviation can have very irregular looking sampling distributions. This can make traditional formula calculations difficult. Is there a way to study sampling variability and estimate population parameters when a sampling distribution is not normal or when traditional formulas are not accurate?

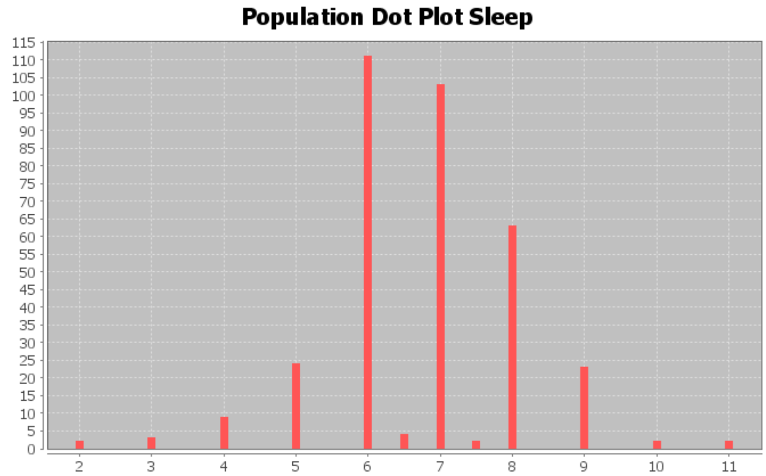
9. The following graph and population mean were created with Statcato from the "age in years" census data (Math 140 Survey Data). Assume this census represents the population of Math 140 statistics students at College of the Canyons in the fall 2015 semester.



Population	Mean
Age in years	22.172

a) What was the shape and mean average of the population?
b) If a random sample was taken from this population, what is the minimum sample size we should have in order to have a nearly normal sampling distribution for sample means?

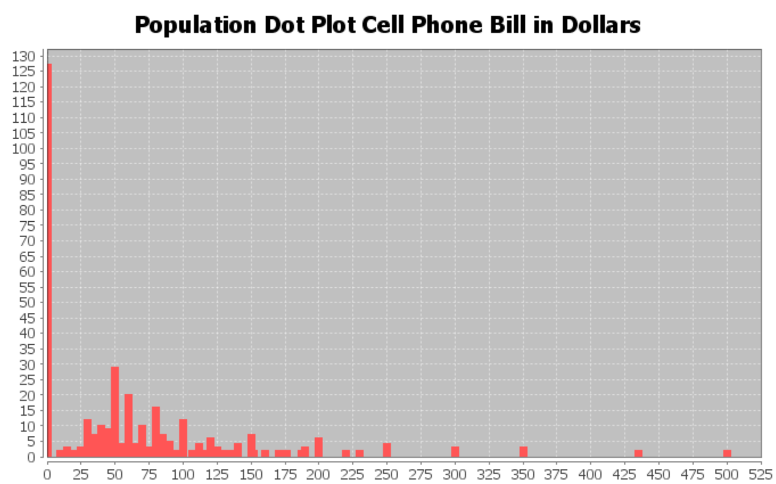
10. The following graph was created with StatKey from the “sleep hours per night” census data (Math 140 Survey Data). Assume this census represents the population of Math 140 statistics students at College of the Canyons in the fall 2015 semester.



Population	Mean
Sleep in hours per night	6.759

a) What was the shape and mean average of the population?
b) If a random sample was taken from this population, what is the minimum sample size we should have in order to have a nearly normal sampling distribution for sample means?

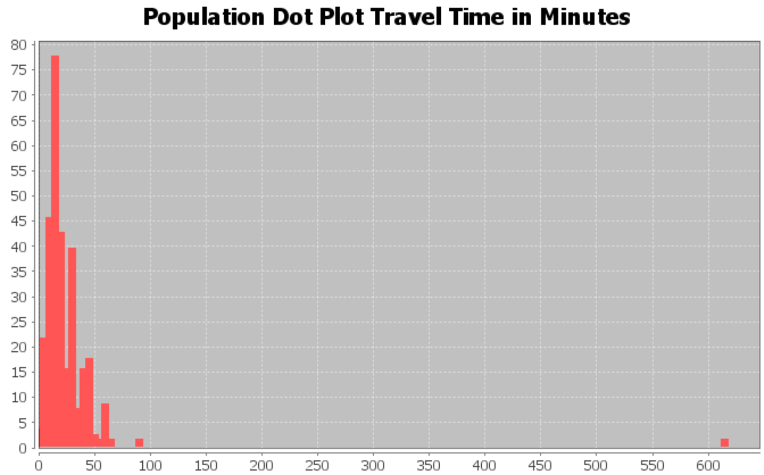
11. The following graph was created with StatKey from the cell phone bill (in dollars per month) census data (Math 140 Survey Data). Assume this census represents the population of Math 140 statistics students at College of the Canyons in the fall 2015 semester.



Population	Mean
Cell Phone Bill in Dollars per month	55.014

a) What was the shape and mean average of the population?
b) If a random sample was taken from this population, what is the minimum sample size we should have in order to have a nearly normal sampling distribution for sample means?

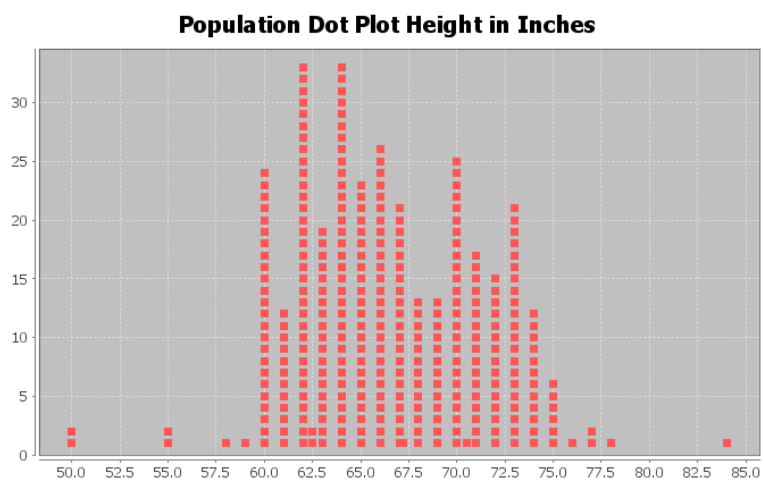
12. The following graph was created with StatKey from the travel time to school in minutes census data (Math 140 Survey Data). Assume this census represents the population of Math 140 statistics students at College of the Canyons in the fall 2015 semester.



Population	Mean
Travel Time to School in Minutes	22.742

a) What was the shape and mean average of the population?
b) If a random sample was taken from this population, what is the minimum sample size we should have in order to have a nearly normal sampling distribution for sample means?

13. The following graph was created with StatKey from the height in inches census data (Math 140 Survey Data). Assume this census represents the population of Math 140 statistics students at College of the Canyons in the fall 2015 semester.



Population	Mean
Height in Inches	66.511

a) What was the shape and mean average of the population?
b) If a random sample was taken from this population, what is the minimum sample size we should have in order to have a nearly normal sampling distribution for sample means?

14. A census of COC statistics students in the fall 2015 semester indicated that the population proportion of statistics students with brown hair is 0.537. Use this population proportion (π) to answer the following questions.

a) Use the formula n = $\frac{10}{(\pi)}$ to calculate the minimum sample size to get at least ten successes in our sample data.
b) Use the formula n = $\frac{10}{(1-\pi)}$ to calculate the minimum sample size to get at least ten failures in our sample data.
c) If our sample data has at least ten successes and at least ten failures, then we expect the sampling distribution for sample proportions to be approximately normal. What is the minimum sample size we expect to have a nearly normal sampling distribution for sample proportions?

15. A census of COC statistics students in the fall 2015 semester indicated that the population proportion of statistics students that smoke cigarettes is 0.091. Use this population proportion (π) to answer the following questions.

a) Use the formula n = $\frac{10}{(\pi)}$ to calculate the minimum sample size to get at least ten successes in our sample data.
b) Use the formula n = $\frac{10}{(1-\pi)}$ to calculate the minimum sample size to get at least ten failures in our sample data.
c) If our sample data has at least ten successes and at least ten failures, then we expect the sampling distribution for sample proportions to be approximately normal. What is the minimum sample size we expect to have a nearly normal sampling distribution for sample proportions?

16. Approximately 60% of college students in the U.S. were able to finish their bachelor's degree in six years. Use this population proportion (π) to answer the following questions.

a) Use the formula n = $\frac{10}{(\pi)}$ to calculate the minimum sample size to get at least ten successes in our sample data.
b) Use the formula n = $\frac{10}{(1-\pi)}$ to calculate the minimum sample size to get at least ten failures in our sample data.
c) If our sample data has at least ten successes and at least ten failures, then we expect the sampling distribution for sample proportions to be approximately normal. What is the minimum sample size we expect to have a nearly normal sampling distribution for sample proportions?

17. Approximately 9.4% of all adults in the U.S. have diabetes. Use this population proportion (π) to answer the following questions.

a) Use the formula n = $\frac{10}{(\pi)}$ to calculate the minimum sample size to get at least ten successes in our sample data.
b) Use the formula n = $\frac{10}{(1-\pi)}$ to calculate the minimum sample size to get at least ten failures in our sample data.
c) If our sample data has at least ten successes and at least ten failures, then we expect the sampling distribution for sample proportions to be approximately normal. What is the minimum sample size we expect to have a nearly normal sampling distribution for sample proportions?

18. Approximately 90% of all lung cancer cases are caused by cigarette smoking. Use this population proportion (π) to answer the following questions.

a) Use the formula n = $\frac{10}{(\pi)}$ to calculate the minimum sample size to get at least ten successes in our sample data.
b) Use the formula n = $\frac{10}{(1-\pi)}$ to calculate the minimum sample size to get at least ten failures in our sample data.
c) If our sample data has at least ten successes and at least ten failures, then we expect the sampling distribution for sample proportions to be approximately normal. What is the minimum sample size we expect to have a nearly normal sampling distribution for sample proportions?

19. Approximately 10% of all people are left handed. Use this population proportion (π) to answer the following questions.

a) Use the formula n = $\frac{10}{(\pi)}$ to calculate the minimum sample size to get at least ten successes in our sample data.
b) Use the formula n = $\frac{10}{(1-\pi)}$ to calculate the minimum sample size to get at least ten failures in our sample data.
c) If our sample data has at least ten successes and at least ten failures, then we expect the sampling distribution for sample proportions to be approximately normal. What is the minimum sample size we expect to have a nearly normal sampling distribution for sample proportions?

20. Approximately 2% of all vehicles sold in the U.S have a manual transmission. Use this population proportion (π) to answer the following questions.

a) Use the formula n = $\frac{10}{(\pi)}$ to calculate the minimum sample size to get at least ten successes in our sample data.
b) Use the formula n = $\frac{10}{(1-\pi)}$ to calculate the minimum sample size to get at least ten failures in our sample data.
c) If our sample data has at least ten successes and at least ten failures, then we expect the sampling distribution for sample proportions to be approximately normal. What is the minimum sample size we expect to have a nearly normal sampling distribution for sample proportions?
