## Statistics Assignment #7

## Due: Dec. 1. 2016

1. Bob Nale is the owner of Nale's Texaco GasTown. Bob would like to estimate the mean number of gallons of gasoline sold to his customers. Assume the number of gallons sold follows the normal distribution with a standard deviation of 2.30 gallons. From his records, he selects a random sample of 60 sales and finds the mean number of gallons sold is 8.6.

- (a) What is the point estimate of the population mean?
- (b) Develop a 99percent confidence interval for the population mean.
- (c) Interpret the meaning of part (b)

2. The mean of a random sample of 25 observations from a normal population whose standard deviation is 40 and sample mean is 200

- (a) Estimate the population mean with 95% confidence.
- (b) Repeat part a changing the population standard deviation to 25.
- (c) Repeat part a changing the population standard deviation to 10
- (d) Describe what happens to the confidence interval estimate when the standard deviation is decreased

3. A statistics professor wants to compare today's students with those 25 years ago. All of his current students' marks are stored on a computer so that he can easily determine the population mean. However, the marks 25 years ago reside only in his musty files. He does not want to retrieve all the marks and will be satisfied with a 95% confidence interval estimate of the mean mark 25 years ago. If he assumes that the population standard deviation is 10, how large a sample should he take to estimate the mean to within 3 marks?

4. Draw diagrams representing what happens to the sampling distribution of a consistent estimator when the sample size increases.

5. The manager of a paint supply store wants to estimate the actual amount of paint contained in 1-gallon cans purchased from a nationally known manufacturer. The manufacturer's specifications state that the standard deviation of the amount of paint is equal to 0.02 gallon. A random sample of 50 cans is selected, and the sample mean amount of paint per 1-gallon can is 0.995 gallon.

- (a) Construct a 99% confidence interval estimate for the population mean amount of paint included in a 1-gallo can.
- (b) On the basis of these results, do you think that the manager has a right to complain to the manufacturer? Why?
- (c) Must you assume that the population amount of paint per can is normally distributed here? Explain.
- (d) Construct a 95% confidence interval estimate. How does this change your answer to (b)?

6. The quality control manager at a light bulb factory needs to estimate the mean life of a large shipment of light bulbs. The standard deviation is 100 hours. A random sample of 64 light bulbs indicated a sample mean life of 350 hours.

- (a) Construct a 95% confidence interval estimate for the population mean life of light bulbs in this shipment.
- (b) Do you think that the manufacturer has the right to state that the light bulbs have a mean life of 400 hours? Explain.
- (c) Must you assume that the population light bulb life is normally distributed? Explain.
- (d) Suppose that the standard deviation changes to 80 hours. What are your answers in (a) and (b)?
- 7. An advertising agency that serves a major radio station wants to estimate the mean amount of time that the station's audience spends listening to the radio daily. From past studies, the standard deviation is estimated as 45 minutes.
  - (a) What sample size is needed if the agency wants to be 90% confident of being correct to within  $\pm 5$  minutes?
  - (b) If 99% confidence is desired, how many listeners need to be selected?
- 8. A growing niche in the restaurant business is gourmetcasual breakfast, lunch, and brunch. Chains in this group include EggSpectation and Panera Bread. Suppose that the mean per-person check for EggSpectation is approximately \$12.50, and the mean per-person check for Panera Bread is \$7.50.
  - (a) Assuming a standard deviation of \$2.00, what sample size is needed to estimate, with 95% confidence, the mean per-person check for EggSpectation to within  $\pm$ \$0.25?
  - (b) Assuming a standard deviation of \$2.50, what sample size is needed to estimate, with 95% confidence, the mean per-person check for EggSpectation to within  $\pm$ \$0.25?
  - (c) Assuming a standard deviation of \$3.00, what sample size is needed to estimate, with 95% confidence, the mean per-person check for EggSpectation to within  $\pm$ \$0.25?
  - (d) Discuss the effect of variation on the sample size needed.