1: Sampling distribution of the sample proportion

(a) Solve:

The following data represent the responses (Y for yes and N for no) from a sample of 40 college students to the question "Do you currently own shares in any stocks?"

N	N	Y	N	N	Y	N	Y	N	Y	N	N	Y	N	Y	Y	N	N	N	Y
N	Y	N	N	N	N	Y	N	N	Y	Y	N	N	N	Y	N	N	Y	N	N

- Determine the sample proportion, p, of college students who own shares of stock.
- If the population proportion is 0.30, determine the standard error of the proportion.

(b) Solve:

For the population of individuals who own an iPhone, suppose $\pi = 0.25$ is the proportion that has a given app. For a particular iPhone owner, let $x = 1$ if they have the app and $x = 0$ otherwise. For a random sample of 50 people who have an iPhone:

- State the population distribution (that is, the probability distribution of X for each observation).
- Find the mean of the sampling distribution of the sample proportion who have the app among the 50 people.
- Find the standard deviation of the sampling distribution of the sample proportion who have the app among the 50 people.
- Explain what the standard deviation in part c describes.

(c) Solve:

You plan to conduct a marketing experiment in which students are to taste one of two different brands of soft drink. Their task is to correctly identify the brand tasted. You select a random sample of 200 students and assume that the students have no ability to distinguish between the two brands. (Hint: If an individual has no ability to distinguish between the two soft drinks, then the two brands are equally likely to be selected.)

- What is the probability that the sample will have between 50% and 60% of the identifications correct?
- The probability is 90% that the sample percentage is contained within what symmetrical limits of the population percentage?
- What is the probability that the sample percentage of correct identifications is greater than 65%?

- Which is more likely to occur: more than 60% correct identifications in the sample of 200 or more than 55% correct identifications in a sample of 1,000? Explain.

2: Sampling distribution of the sample mean

(a) Solve:

According to the 2010 U.S. Census Bureau Current Population Survey (www.census.gov/population/www/socdemo/hh-fam/cps2010.html), the average number of people in family households which contain both family and non-family members is 4.43 with a standard deviation of 2.02. This is based on census information for the population. Suppose the Census Bureau instead had estimated this mean using a random sample of 225 homes. Suppose the sample had a sample mean of 4.2 and standard deviation of 1.9.

- Identify the random variable X. Indicate whether it is quantitative or categorical.
- Describe the center and variability of the population distribution. What would you predict as the shape of the population distribution? Explain.
- Describe the center and variability of the data distribution. What would you predict as the shape of the data distribution? Explain.
- Describe the center and variability of the sampling distribution of the sample mean for 225 homes. What would you predict as the shape of the sampling distribution? Explain.

(b)Solve:

A large corporation employs 27,251 individuals. The average income in 2008 for all employees was $74,550 with a standard deviation of $19,872. You are interested in comparing the incomes of today?s employees with those of 2008. A random sample of 100 employees of the corporation yields $?? = +75,207$ and $s = +18,901$.

- Describe the center and variability of the population distribution. What shape does it probably have? Explain.
- Describe the center and variability of the data distribution. What shape does it probably have? Explain.
- Describe the center and variability of the sampling distribution of the sample mean for $n = 100$. What shape does it have? Explain.
- Explain why it would not be unusual to observe an individual who earns more than $100,000, but it would be highly unusual to observe a sample mean income of more than $100,000 for a random sample size of 100 people.

(c)Solve:

Junk bonds reported strong returns in 2009. The population of junk bonds earned a mean return of 57.5% in 2009. (Data extracted from The Wall Street Journal, January 4, 2010, p. R1.) Assume that the returns for junk bonds were distributed as a normal random variable, with a mean of 57.5 and a standard deviation of 20. If you selected a random sample of 16 junk bonds from this population, what is the probability that the sample would have a mean return

- less than 50?
- between 40 and 60?
- greater than 40?