7.9 Problem Set 1

Question 1, Page 324, 14th Edition: Consider a finite population with five elements labeled A, B, C, D, and E. Ten possible simple random samples of size 2 can be selected.

(a) List the 10 samples beginning with AB, AC, and so on.

(b) Using simple random sampling, what is the probability that each sample of size 2 is selected?

(c) Assume random number 1 corresponds to A, random number 2 corresponds to B, and so on. List the simple random sample of size 2 that will be selected by using the random digits 8 0 5 7 5 3 2

Question 11, Page 329, 14th Edition: The following data are from a simple random sample:

5 8 10 7 10 14

(a) What is the point estimate of the population mean?

(b) What is the point estimate of the population standard deviation?

Question 12, Page 330, 14th Edition: A survey question for a sample of 150 individuals yielded 75 Yes responses, 55 No responses, and 20 No Opinions.

(a) What is the point estimate of the proportion in the population who respond Yes?

(b) What is the point estimate of the proportion in the population who respond No?

Question 14, Page 330, 14th Edition: Morningstar publishes ratings data on 1208 company stocks. A sample of 40 of these stocks is contained in the file Morningstar. Use the Morningstar data set to answer the following questions.

(a) Develop a point estimate of the proportion of the stocks that receive Morningstar's highest rating of 5 Stars.

(b) Develop a point estimate of the proportion of the Morningstar stocks that are rated Above Average with respect to business risk.

(c) Develop a point estimate of the proportion of the Morningstar stocks that are rated 2 Stars or less.

Question 16, Page 330, 14th Edition: A sample of 426 U.S. adults age 50 and older were asked how important a variety of issues were in choosing whom to vote for in the 2012 presidential election (AARP Bulletin, March 2012).

1. What is the sampled population for this study?
2. Social Security and Medicare was cited as "very important" by 350 respondents. Estimate the proportion of the population of U.S. adults age 50 and over who believe this issue is very important.
3. Education was cited as "very important" by 74% of the respondents. Estimate the number of respondents who believe this issue is very important.
4. Job Growth was cited as "very important" by 354 respondents. Estimate the proportion of U.S. adults age 50 and over who believe job growth is very important.
5. What is the target population for the inferences being made in parts (b) and (d)? Is it the same as the sampled population you identified in part (a)? Suppose you later learn that the sample was restricted to members of the American Association of Retired People (AARP). Would you still feel the inferences being made in parts (b) and (d) are valid? Why or why not?

Question 25, Page 342, 14 Edition: The College Board reported the following mean scores for the three parts of the Scholastic Aptitude Test (SAT) (*The World Almanac, 2009*):

Critical Reading 502
Mathematics 515
Writing 494

Assume that the population standard deviation on each part of the test is $\sigma = 100$

1. What is the probability a sample of 90 test takers will provide a sample mean test score within 10 points of the population mean of 502 on the Critical Reading part of the test?

2. What is the probability a sample of 90 test takers will provide a sample mean test score within 10 points of the population mean of 515 on the

Mathematics part of the test? Compare this probability to the value computed in part (1).

3. What is the probability a sample of 100 test takers will provide a sample mean test score within 10 of the population mean of 494 on the writing part of the test? Comment on the differences between this probability and the values computed in parts (1) and (2).

Question 26, Page 342, 14th Edition: **Federal Income Tax Returns**. The Wall Street Journal reports that 33% of taxpayers with adjusted gross incomes between \$30,000 and \$60,000 itemized deductions on their federal income tax return. The mean amount of deductions for this population of taxpayers was \$16,642. Assume the standard deviation is $\sigma = 2400$.

(a) What is the probability that a sample of taxpayers from this income group who have itemized deductions will show a sample mean within \$200 of the population mean for each of the following sample sizes: 30, 50, 100, and 400?

(b) What is the advantage of a larger sample size when attempting to estimate the population mean?

Question 28, Page 343, 14 Edition **State Rainfalls**: The state of California has a mean annual rainfall of 22 inches, whereas the state of New York has a mean annual rainfall of 42 inches (Current Results website, October 27, 2012). Assume that the standard deviation for both states is 4 inches. A sample of 30 years of rainfall for California and a sample of 45 years of rainfall for New York has been taken.

(a) Show the probability distribution of the sample mean annual rainfall for California.

(b) What is the probability that the sample mean is within 1 inch of the population mean for California?

(c) What is the probability that the sample mean is within 1 inch of the population mean for New York?

(d) In which case, part (b) or part (c), is the probability of obtaining a sample mean within 1 inch of the population mean greater? Why?

Question 41, Page 349, 14 Edition: Household Grocery Expenditures: The Food Marketing Institute shows that 17% of households spend more than \$100 per week on groceries. Assume the population proportion is p = 0.17 and a sample of 800 households will be selected from the population.

a. Show the sampling distribution of p, the sample proportion of households spending more than \$100 per week on groceries.

b. What is the probability that the sample proportion will be within ±0.02 of the population proportion?

c. Answer part (b) for a sample of 1600 households.

Question 46, Page 363, 14 Edition University Costs: After deducting grants based on need, the average cost to attend the University of Southern California (USC) is $27,175 (u.S. news & World report, america's Best Colleges,2009 ed.). Assume the population standard deviation is $7400. Suppose that a random sample of 60 USC students will be taken from this population.

(a) What is the value of the standard error of the mean?

(b) What is the probability that the sample mean will be more than $27,175?

(c) What is the probability that the sample mean will be within $1000 of the population mean?

(d) How would the probability in part (c) change if the sample size were increased to 100?

Question 62, Page 365 14 ed Lori Jeffrey is a successful sales representative for a major publisher of college textbooks. Historically, Lori obtains a book adoption on 25% of her sales calls. Viewing her sales calls for one month as a sample of all possible sales calls, assume that a statistical analysis of the data yields a standard error of the proportion of .0625.

(a) How large was the sample used in this analysis? That is, how many sales calls did Lori make during the month?

(b) Let $\bar{p}$ indicate the sample proportion of book adoptions obtained during the month. Show the sampling distribution of $\bar{p}$.

(c) Using the sampling distribution of $\bar{p}$, compute the probability that Lori will obtain book adoptions on 30% or more of her sales calls during a one-month period.