***CHAPTER 8 –Estimation: Additional Topics-***

1. Which of the following statements is false?
2. To cut the width of a confidence interval in half, one has to double the sample size
3. In determining the necessary sample size in making an interval estimate for a population mean, it is first necessary to first make an estimate of the population standard deviation
4. In the formula  *ME* represents half the width of the confidence interval
5. None of the above
6. A career counselor is interested in examining the salaries earned by graduate business school students at the end of the first year after graduation. In particular, the counselor is interested in seeing whether there is a difference between men and women graduates’ salaries. From a random sample of 55 men, you find the mean salary to be $47,520 with a standard deviation of $5,633. From a sample of 64 women, you find the mean salary to be $44,304 with a standard deviation of $4,793. What is the 95% confidence interval for the difference between the population mean salary for men and women? Assume the random sample observations are from normally distributed populations, and that the population variances are assumed to be equal.
7. $3,216  
8. $3,216  
9. $3,216  
10. $3,216  
11. In order to construct a confidence interval estimate for the difference between two population means, independent samples are obtained from two normal populations with unknown but equal variances. If the first sample contains 18 items and the second sample contains 14 items, which of the following distributions will be used?
    1. The normal distribution
    2. The *t* distribution with 13 degrees of freedom
    3. The *t* distribution with 17 degrees of freedom
    4. The *t* distribution with 30 degrees of freedom
12. In a recent survey of 240 teachers in Richmond, Virginia, 77.2% supported standardized national testing of elementary students. In a survey of 162 teachers in Raleigh, North Carolina, 64.2% supported national testing. Find a 99% confidence interval for the difference between the two population proportions.
13. 0.13  0.119
14. 0.13  0.092
15. 0.13  0.135
16. 0.13  0.148
17. Because of the popularity of movies as an entertainment medium for college students, a marketing research firm plans to do a national study on the average cost of a movie ticket. Assuming that  = $0.50, what sample size is needed to be 95% confident that the estimate is within $0.25 of the true mean ticket prices?
18. 15
19. 7
20. 16
21. 8
22. The banking industry has suffered in recent years because of a high default rate on mortgage and consumer loans. How large a sample must be taken from banking records to be 98% confident that the estimate for the amount of these defaults is within $1000 of the true mean loan amount? Assume the population standard deviation is $10,000.
23. 567
24. 233
25. 240
26. 543
27. The pooled variance is used in constructing a confidence interval for the difference between two population means whenever the two populations
    1. are normally distributed
    2. have equal variances
    3. are both normally distributed and have equal variances
    4. None of the above
28. The Arkansas State Police wish to estimate the average mph being traveled on the Interstate Highways, which cross the state. If the estimate is to be within 8 mpg of the true mean with 98% confidence and the population standard deviation is 22 mph, how large a sample size must be taken?
29. 42
30. 15
31. 329
32. 14
33. The pooled variance is used in constructing a confidence interval for the difference between two population means whenever the two populations
    1. are normally distributed
    2. have equal variances
    3. are both normally distributed and have equal variances
    4. None of the above
34. After calculating the sample size needed to estimate a population proportion to within .04, your statistics professor told you the maximum allowable error must be reduced to just .01. If the original calculation led to a sample size of 800, the sample size will now have to be:
35. 800
36. 3200
37. 12,800
38. 6400
39. Which of the following statements is false?
40. Independent samples are those for which the selection process for one is not related to the selection process for the other.
41. Samples are paired when the selection process for one is related to the selection process for the other.
42. When comparing two independent samples, the null and alternative hypotheses can be expressed in terms of either the population parameters or the sampling distribution of the difference between the sample statistics.
43. None of the above.
44. The confidence interval for the difference between two population means that are normally distributed where the population variances are unknown but assumed equal rely on the use of
    1. Satterthwaite's approximation
    2. the pooled sample variance
    3. the largest sample variance
    4. the average sample variance
45. A political analyst in the Northeast surveys a random sample of registered Democrats and compares the results with those obtained from a random sample of registered Republicans. This would be an example of:
46. independent samples
47. paired samples
48. independent samples only if the sample sizes are equal
49. paired samples only if the sample sizes are equal
50. An economist is interested in studying the incomes of college graduates in China. The population standard deviation is known to be $1,200. What sample size would the economist need to use for a 95% confidence interval if the width of the interval should not be more than $125?
    1. 93
    2. 114
    3. 354
    4. 1417
51. Two samples of sizes 25 and 35 are independently drawn from two normal populations, where the unknown population variances are assumed to be equal. What is the number of degrees of freedom of the equal-variances *t* test statistic?
52. 60
53. 59
54. 58
55. 35
56. Independent samples of math scores from students in the U.S. and Europe were collected from normal populations. A sample of 50 students from the U.S. had an average score of 570 while a sample of 50 European students had an average score of 540. Assume the population standard deviations for the US and Europe are 102 and 115, respectively. What is the 95% confidence interval for the difference between population means?
    1. 30  35.65
    2. 30  21.73
    3. 30  42.61
    4. 30  64.23
57. You are interested in determining the average cost of a 3-minute telephone call to locations within the continental U.S. What sample size must you take to be 96% confident that the results will be within $.75 of the true mean cost per call given that?
58. 185
59. 445
60. 406
61. 574
62. A confidence interval was used to estimate the proportion of students at Utah Valley University who commute from home to campus more than 10 miles a day. A random sample of 100 students generated the following 95% confidence interval: (0.588, 0.654). Using the information above, what size sample would be necessary to estimate the true proportion to within http://wps.prenhall.com/wps/media/objects/3424/3507189/screencaps/plusunderline.gif0.06 using 95% confidence?
    1. 205
    2. 147
    3. 533
    4. 267
63. An economist is interested in studying the incomes of college graduates in China. The population standard deviation is known to be $1,200. What sample size would the economist need to use for a 95% confidence interval if the width of the interval should not be more than $125?
    1. 93
    2. 114
    3. 354
    4. 1417
64. The pooled variance is formed by combining information from two independent samples. If  =39,  = 25, and  then  is
65. 64
66. 8
67. 32
68. 14
69. Two samples of sizes 25 and 35 are independently drawn from two normal populations, where the unknown population variances are assumed to be equal. What is the number of degrees of freedom of the equal-variances *t* test statistic?
    1. 60
    2. 22.59
    3. 23.58
    4. 35
70. Which of the following statements is false?
71. Comparing the final test scores of male and female students in a statistics class is an example of two dependent samples.
72. Pretest versus posttest (before versus after) studies usually use dependent samples, not independent samples.
73. Studies involving measures of a characteristic from identical twins result in dependent samples of data.
74. None of the above
75. A political analyst in Michigan surveys a random sample of registered Democrats and compares the results with those obtained from a random sample of registered Republicans. This would be an example of:
76. dependent samples.
77. independent samples.
78. independent samples only if the sample sizes are equal.
79. dependent samples only if the sample sizes are equal.
80. In constructing a 95% confidence interval estimate for the difference between the means of two normally distributed populations, where the unknown population variances are assumed not to be equal, summary statistics computed from two independent samples are as follows: , , , , , and . The upper confidence limit is:
81. 19.123
82. 28.212
83. 24.911
84. 5.788
85. The larger the level of confidence used in constructing a confidence interval estimate of the difference between two population proportions:
    1. the smaller the probability that the confidence interval will contain the difference between the population proportions
    2. the smaller the value of 
    3. the wider the confidence interval
    4. the narrower the confidence interval
86. The sample size needed to estimate a population mean to within 10 units was found to be 68. If the population standard deviation was 50, then the confidence level used was
87. 99%
88. 95%
89. 90%
90. 80%
91. In calculating the 95% confidence interval for  the difference between the means of two normally distributed populations, summary statistics from two independent samples are:  What is the upper limit of the confidence interval?
92. 10.953
93. 9.0475
94. 9.2163
95. 10.784
96. In a random sample of 500 California residents, 350 indicated they were home owners. In another random sample of 700 Florida residents, 455 were home owners. What is the 99% confidence interval for the difference between the proportions?
    1. 0.050.070
    2. 0.050.085
    3. 0.050.053
    4. 0.050.045
97. Which of the following statements is correct?
98. A confidence level of 80 percent implies a probability of .80 that the unknown population parameter can be found within the limits of any *one* 80% confidence interval.
99. A confidence level of 95 percent implies a probability of .95 that the unknown population parameter can be found within the limits of any *one* 95% confidence interval.
100. Both (A) and (B).
101. Neither (A) nor (B).

**Short Answer and Applied Questions**

1. A researcher is interested in determining the proportion of college students who have participated in an internship. How large of a sample should the researcher take in order to estimate the proportion of all college students who have participated in an internship to within 3%? Assume that the researcher wants to have 95% reliability in his results.
2. Assume that the temperature of a blast furnace is normally distributed. You inspect the temperature of the furnace at 15 random times over the week, and calculate the standard deviation to be 57.3 degrees. Develop a 98% confidence interval for the standard deviation of the temperature for the population.
3. You want to estimate the proportion of students at your school who are in favor of imposing a student fee to pay for a new sports center. How large of a sample do you need to take in order to estimate the proportion of all students who favor the fee within 4%? Compute this number for a 90% confidence level.
4. Assume that the temperature of a blast furnace is normally distributed. A quality control inspector checked the temperature of the furnace at 15 random times over the week, and calculated the 95% confidence interval for the population standard deviation to be 21.4 to 46.0 degrees. What was the sample standard deviation?
5. You are interested in examining the salaries earned by graduate business school students at the end of the first year after graduation. In particular, you are interested in seeing whether there is a difference between men and women graduates’ salaries. From a random sample of 55 women, you find the mean salary to be $47,520 with a standard deviation of $5,633. From a sample of 64 men, you find the mean salary to be $44,304 with a standard deviation of $4,793. Assume the random sample observations are from normally distributed populations, and that the population variances are assumed to be equal. Develop a 95% confidence interval for the difference between the population mean salary for men and women.

**THE NEXT TWO QUESTIONS ARE BASED ON THE FOLLOWING INFORMATION:**

A dependent random sample from two normally distributed populations gives the following results: *n* = 15, = 20.5, and = 2.4.

1. Find the margin of error for a 95% confidence interval for the difference in the means of the two populations.
2. Find the 95% confidence interval for the difference in the means of the two populations.
3. Use statistical software to find an 80% confidence interval for the difference between the two population means for the below data.

A random sample of eight salespersons that attended a motivational course on sales techniques was monitored in the three months before and the three months after the course. The table shows the values of sales (in thousands of dollars) generated by these six salespersons in the two periods. Assume that the population distributions are normal.

|  |  |  |
| --- | --- | --- |
| *Salesperson* | *Before Course* | *After Course* |
| 1 | 215 | 240 |
| 2 | 280 | 290 |
| 3 | 205 | 195 |
| 4 | 330 | 334 |
| 5 | 170 | 190 |
| 6 | 198 | 184 |
| 7 | 204 | 210 |
| 8 | 275 | 290 |

1. Estimate with 95% confidence the difference between the two population mean scores bor the below data; do not assume equal population variances.

From a random sample of seven students in a marketing research class that uses group-learning techniques, the mean examination score was found to be 78.25 and the sample standard deviation was 2.87. For an independent random sample of ten students in another marketing research class that does not use group-learning techniques, the sample mean and standard deviation of exam scores were 74.94 and 9.15, respectively.

1. Suppose, for a random sample of 250 firms that revalued their fixed assets, the mean ratio of debt to tangible assets was 0.528 and the sample standard deviation was 0.151. For an independent random sample of 500 firms that did not revalue their fixed assets was 0.502 and the sample standard deviation was 0.162. Find a 99% confidence interval for the difference between the two population means.
2. Find a 95% confidence interval for the difference between the two population proportions. In a random sample of 125 large retailers, 90 used regression as a method of forecasting. In an independent random sample of 160 small retailers, 80 used regression as a method of forecasting.
3. A random sample of 100 men contained 63 in favor of a state constitutional amendment to retard the rate of growth of property taxes. An independent random sample of 100 women contained 55 in favor of this amendment. The confidence interval 0.012 <-< 0.148 was calculated for the difference between the population proportions. What is the confidence level of this interval?
4. Find the lower and upper confidence limits for a 95% confidence interval of the population variance given a sample of size 25, a sample variance of 81, and that the population distribution is normal.

**THE NEXT THREE QUESTIONS ARE BASED ON THE FOLLOWING INFORMATION:**

A clinic offers a weight-reduction program. A review of its records found the following weight losses, in pounds, for a random sample of 12 clients at the conclusion of the program: 17.8, 20.5, 17.5, 13.3, 18.2, 26.9, 19.2, 8.3, 12.8, 16.4, 21.3, and 17.4.

1. Calculate the sample variance of weight losses
2. Find a 90% confidence interval for the population variance of weight losses for clients of this weight-reduction program.
3. Find a 90% confidence interval for the population standard deviation of weight losses for clients of this weight-reduction program.

**THE NEXT THREE QUESTIONS ARE BASED ON THE FOLLOWING INFORMATION:**

Different values of the margin of error and level of significance are given.

1. How large a sample is needed to estimate the population proportion for *ME* = 0.05 and = 0.01?
2. How large a sample is needed to estimate the population proportion for *ME* = 0.05 and = 0.10?
3. Compare and comment on your answers to the previous two questions.

**THE NEXT FIVE QUESTIONS ARE BASED ON THE FOLLOWING INFORMATION:**

A research group wants to estimate the proportion of consumers who plan to buy a scanner for their personal computer during the next three months.

1. How many people should be sampled so that the sampling error is at most 0.06 with a 90% confidence interval?
2. What is the sample size required if the confidence is increased to 95%, keeping the sampling error the same?
3. What is the required sample size if the research group reduced the sampling error to 0.03 and wants a 98% confidence level?
4. Without using the formula for determining the sample size, how many people should be sampled if the sampling error in the first question became 0.03 instead of 0.06 with the same 90% confidence interval?
5. Without using the formula for determining the sample size, what is the required sample size if the research group increased the sampling error in the third question to 0.06 instead of 0.03 and kept the confidence level at 98%?
6. The Parks Department manager wants to estimate the average number of bottled drinks sold each day out of the vending machine. Similar vending machine sales have a standard deviation of 9 bottles per day. To be 95% confident that the estimate,, obtained is within 3 bottles of the true mean , how large a sample is needed?
7. A proponent of private aid to assist those who are suffering from hunger decided to take a random sample to estimate the average annual contribution in the community donated to relieve world hunger. A similar study in a comparable community reported the standard deviation of giving as $15. The proponent believes that the estimate,, should be within $3 of the true average and with 92-percent confidence. Determine the appropriate sample size.