Problem Set Section 2D

(For #1-10) Add and subtract the given sample statistic and margin of error to find the confidence interval estimate of the population value. Then write the confidence interval using both inequality notation and using interval notation. Now write a sentence explaining the confidence interval to someone.

Confidence interval = Sample Statistic ± Margin of Error

1. "What is the population percent of the adult population is infected with this disease?"
   Sample percentage = 4.9%
   Margin of error = 1.3% (Found with 95% confidence level.)

2. "What is the population mean average height for men?"
   Sample mean = 68.335 inches
   Margin of error = 1.293 inches (Found with 99% confidence level.)

3. What is the population standard deviation for the systolic blood pressure in women?
   (Assume there was a normal sampling distribution.)
   Sample standard deviation = 17.11 mm of Hg
   Margin of error = 3.31 mm of Hg (Found with 90% confidence level.)

4. What is the population percentage of left-handed people get migraine headaches?
   Sample proportion = 0.088
   Margin of error = 0.027 (Found with 95% confidence level.)

5. What is the population mean average price of a used mustang car in thousands of dollars?
   Sample mean = 15.98 thousand dollars
   Margin of error = 3.78 thousand dollars (Found with 90% confidence level.)

6. "What is the population percentage of rabid animals are wild?"
   Sample proportion = 0.903
   Margin of error = 0.008 (Found with 95% confidence level.)

7. "What is the population mean average weight for men?"
   Sample mean = 172.55 pounds
   Margin of error = 11.272 pounds (Found with 99% confidence level.)

8. What is the population variance for the heights of men? (Assume there was a normal sampling distribution.)
   Sample variance = 10.177 square inches
   Margin of error = 3.661 square inches (Found with 90% confidence level.)

9. What is the population percentage of women in the U.S. are overweight?
   Sample percentage = 36.9%
   Margin of error = 1.44% (Found with 95% confidence level.)

10. What is the population mean average amount of tip in dollars at a particular restaurant?
    Sample mean = $3.849
    Margin of error = $0.504 (Found with 99% confidence level.)

(For #11-20) Write a sentence explaining each of the following confidence intervals. Then use the following formulas to identify the sample statistic ($\hat{p}$ or $\bar{x}$ or s) and the margin of error.

Sample Statistic = $\frac{(upper\ limit + lower\ limit)}{2}$ Margin of Error = $\frac{(upper\ limit - lower\ limit)}{2}$

11. A 95% confidence interval estimate of the population proportion of fat in the milk from Jersey cows is (0.046 , 0.052).

12. A 99% confidence interval estimate of the population mean number of miles is 13.4 miles < μ < 17.2 miles.

13. A 90% confidence interval estimate of the population proportion of people who will vote for the Independent party candidate is 0.068 < π < 0.083.

14. A 95% confidence interval estimate of the population mean amount of milk in gallons is (48.7 , 58.4).

15. A 99% confidence interval estimate of the population standard deviation for the height of men in inches is 2.34 < σ < 2.87. Assume there was a normal sampling distribution.

16. A 95% confidence interval estimate of the population proportion of peanuts in a can of mixed nuts is 0.4221 < π < 0.6179.

17. A 99% confidence interval estimate of the population mean pH of lakes in Florida is (6.118 , 7.064).

18. A 90% confidence interval estimate of the population proportion of home teams that win a soccer game is (0.5093 , 0.6574)

19. A 95% confidence interval estimate of the population mean average price of apartments in Manhattan, NY is $2514.36 < μ < $3798.64.

20. A 90% confidence interval estimate of the population variance for the pH of lakes in Florida is $1.2353 < \sigma^2 < 2.3675$. Assume there was a normal sampling distribution.

(#21-26) Go to www.matt-teachout.org and click on "statistics" and then "data sets". Open the "coffee data" and copy and Columbian Mild price data. Now go to www.lock5stat.com and click on the "StatKey" button. Under the "sampling distribution" menu click on "mean". Under edit data, paste the Columbian Mild coffee data. Click on "samples of size n" and put in 30. Turn off the button that says, "First column is identifier" as we have only a single column of data. Now click ok. You are now ready to create your sampling distribution. This time we want the computer to create a confidence interval for each sample it takes. On the right side of the screen, click on the button that says confidence intervals and set the confidence level to 95%. StatKey will take a random sample from the population data, find the sample mean and place a dot for the sample mean in the distribution. It will also create a confidence interval from that sample mean. StatKey will keep track of whether the true population mean is actually contained in the confidence interval or not. Green means the confidence interval did contain the population value and red means that the confidence interval did not contain the population value. Now answer the following questions.

21. Notice the confidence intervals for sample means were different for each random sample. Discuss the implications of sampling variability on the accuracy of a confidence interval from a random sample.

22. What was the population mean in cents per pound? Did all the confidence intervals contain the population mean? What does it mean that the interval "contained" or "captured" the population mean?

23. How many total random samples did you take? How many of them contained the population mean? What percent of the confidence intervals contained the population mean?

24. How many confidence intervals did not contain the population mean? What percent of the confidence intervals did not contain the population mean?

25. As the number of random samples increased, did the percentage of confidence intervals that contained the population mean get closer or farther away from 95%? Why do you think that is?

26. Here is the definition of 95% confidence: "95% of confidence intervals contain the population parameter and 5% do not contain the population parameter". Explain this definition of 95% confidence in your own words.

(#27-32) Assume a fair coin has a 50% (0.5) chance of getting tails. If we take samples from that population, the sample proportions will usually not be 0.5. We want to look at lots of proportion confidence intervals from sample proportions. Go to www.lock5stat.com and click on the "StatKey" button. Under the "sampling distribution" menu click on "proportion". Under "edit proportion", put in 0.5 and then click ok. Under "sample size", set it to "n = 30". You are now ready to create your sampling distribution. We want the computer to create a confidence interval for each sample proportion. On the right side of the screen, click on the button that says confidence intervals and set the confidence level to 90%. StatKey will take a random sample from the population data, find the sample proportion and place a dot for the sample proportion in the distribution. It will also create a confidence interval from that sample. Remember that the population proportion for a fair coin is 0.5 (50%). StatKey will keep track of whether the true population proportion is actually contained in the confidence interval or not. Green means the confidence interval did contain the population value and red means that the confidence interval did not contain the population value. Now answer the following questions.

27. Notice the confidence intervals for sample proportions were different for each random sample. Discuss the implications of sampling variability on the accuracy of a confidence interval created from a random sample proportion.

28. Did all the confidence intervals contain the population proportion of 0.5? What does it mean that the interval "contained" or "captured" the population parameter?

29. How many total confidence intervals did you make? How many of them contained the population proportion 0.5? What percent of the confidence intervals contained the population proportion 0.5?

30. How many of the confidence intervals did not contain the population proportion 0.5? What percent of the confidence intervals did not contain the population proportion 0.5?

31. As the number of random samples increased, did the percentage of confidence intervals that contained the population proportion get closer or farther away from 90%? Why do you think that is?

32. Here is the definition of 90% confidence: "90% of confidence intervals contain the population parameter and 10% do not contain the population parameter". Explain this definition of 90% confidence in your own words.
