Problems Section 2F

1. What are the conditions we should check if we want to use sample data to calculate a two-population proportion confidence interval?

2. What are the conditions we should check if we want to use sample data to calculate a two populations mean confidence interval from independent groups? What are the conditions we should check if we want to use sample data to calculate a matched-pair population mean confidence interval?

3. What are the conditions we should check if we want to use sample data to calculate a two-population bootstrap confidence interval?

(#4-12) Answer the following questions. Assume the confidence intervals met the assumptions.

4. A two-population mean confidence interval is (+3.4 kg , +5.9 kg). They used a 90% confidence level.

    a) Is the mean from population 1 significantly higher, significantly lower, or not significantly different from the mean from population 2? Explain how you know.
    b) How much higher could the population mean from population 1 than the population mean from population 2?
    c) Write the two-population confidence interval sentence explaining this confidence interval.

5. A two-population proportion confidence interval is (−0.115 , −0.068). They used a 95% confidence level.

    a) Is the percentage from population 1 significantly higher, significantly lower, or not significantly different from the percentage from population 2? Explain how you know.
    b) How much lower could the percentage from population 1 be than the percentage from population 2?
    c) Write the two-population confidence interval sentence explaining this confidence interval.

6. A two-population mean confidence interval is (−16.4°F , +8.2°F). They used a 99% confidence level.

    a) Is the mean from population 1 significantly higher, significantly lower, or not significantly different from the mean from population 2? Explain how you know.
    b) Write the two-population confidence interval sentence explaining this confidence interval.

7. A two-population proportion confidence interval is (−0.045 , +0.038). They used a 90% confidence level.

    a) Is the percentage from population 1 significantly higher, significantly lower, or not significantly different from the percentage from population 2? Explain how you know.
    b) Write the two-population confidence interval sentence explaining this confidence interval.

8. A two-population mean confidence interval is (−$185.71 , −$103.62). They used a 95% confidence level.

    a) Is the mean from population 1 significantly higher, significantly lower, or not significantly different from the mean from population 2? Explain how you know.
    b) How much lower could the population mean from population 1 than the population mean from population 2?
    c) Write the two-population confidence interval sentence explaining this confidence interval.

9. A two-population proportion confidence interval is (+0.049 , +0.058). They used a 99% confidence level.

   a) Is the percentage from population 1 significantly higher, significantly lower, or not significantly different from the percentage from population 2? Explain how you know.
   b) How much higher could the percentage from population 1 be than the percentage from population 2?
   c) Write the two-population confidence interval sentence explaining this confidence interval.

10. A two-population mean confidence interval is (−6.233℃ , −4.718℃). They used a 90% confidence level.

   a) Is the mean from population 1 significantly higher, significantly lower, or not significantly different from the mean from population 2? Explain how you know.
   b) How much lower could the population mean from population 1 than the population mean from population 2?
   c) Write the two-population confidence interval sentence explaining this confidence interval.

11. A two-population proportion confidence interval is (−0.071 , +0.068). They used a 95% confidence level.

   a) Is the percentage from population 1 significantly higher, significantly lower, or not significantly different from the percentage from population 2? Explain how you know.
   b) Write the two-population confidence interval sentence explaining this confidence interval.

12. A two-population mean confidence interval is (+32.8 cm , +37.1 cm). They used a 99% confidence level.

   a) Is the mean from population 1 significantly higher, significantly lower, or not significantly different from the mean from population 2? Explain how you know.
   b) How much higher could the population mean from population 1 than the population mean from population 2?
   c) Write the two-population confidence interval sentence explaining this confidence interval.

(#13-20) Directions: Use the following Statcato and StatKey printouts and answer the following questions.

a) Does the data meet the assumptions for inference with two population proportions or two population means? If it is two means, are the groups independent or matched pair? List the assumptions needed and how the problem meets them or does not meet them.

b) Give the sample means or sample proportions for the two groups. Are they close or significantly different? Explain how you know. If they are significantly different, which group has a significantly higher sample mean or sample proportion?

c) Does the confidence interval indicate that the mean or percentage from population 1 is higher, lower, or not significantly different from population 2? Explain how you know. If the mean or percentage from population 1 is higher than population 2, then how much higher could it be? If the mean or percentage from population 1 is lower than population 2, then how much lower could it be?

d) Write the two-population confidence interval sentence explaining this confidence interval.

13. The ACT exam is used by many colleges to test the readiness of high school students for college. Many high school students are now taking ACT prep classes. A local high school offers an ACT prep class, but wants to know if it really helps. Twenty-eight students were randomly selected. They took the ACT exam before and after taking the ACT prep class. Population 1 is the ACT scores after taking the prep class and population 2 is the ACT scores before taking the prep class. The sample mean of the differences was 5.8 ACT points and the sample standard deviation of the differences was 4.3 ACT points. A histogram of the differences was normal. We created a 90% confidence interval for matched pairs with Statcato.

Confidence Interval - Matched Pairs: confidence level = 0.9
Input: Summary data
Difference of Matched Pairs -

N	Mean	Stdev	Margin of Error	90.0%CI
28	5.8	4.3	1.384	(4.4159, 7.1841)

14. We want to compare the population percentage of people that identify as women and have at least one tattoo (π_1) and the population percentage of people that identify as men and have at least one tattoo (π_2). A random sample of 794 people that identify as women found that 137 of them had at least one tattoo. A random sample of 857 people that identify as men found that 146 of them had at least one tattoo. Go to www.lock5stat.com and use StatKey to create a 99% two-population proportion bootstrap confidence interval.

15. Cotinine is an alkaloid found in tobacco and is used as a biomarker for exposure to cigarette smoke. It is especially useful in examining a person's exposure to second hand smoke. A random sample of 90 non-smoking American adults was collected. These adults were not smokers and did not live with any smokers. The average cotinine level for this sample was 7.2 ng/mL with a standard deviation of 5.8 ng/mL. A second sample of 85 non-smoking American adults was then collected. These adults did not smoke themselves, but did live with one or more smokers. The average cotinine level for this sample was 28.5 and had a standard deviation of 11.4. Population 1 was people that do NOT live with smokers (μ_1) and population 2 was people that DO live with smokers (μ_2). We used Statcato to create the following 95% two-population mean confidence interval for independent groups.

Confidence Intervals - Two population means: confidence level = 0.95

	N	Mean	Stdev
Population 1	90	7.2	5.8
Population 2	85	28.5	11.4

* Population standard deviations are unknown. *
DOF = 123
Margin of error = 2.730
95.0%CI = (-24.0304, -18.5696)

16. A body mass index of 20-25 indicates that a person is of normal weight. Use the following 90% two-population proportion confidence interval to compare the percentage of people that identify as men with a normal BMI (π_1) and the percentage of people that identify as women with a normal BMI (π_2). A random sample of 745 people that identify as women found that 198 of them had a normal BMI. A random sample of 760 people that identify as men found that 273 of them had a normal BMI score.

Confidence Interval - Two population proportions: confidence level = 0.9

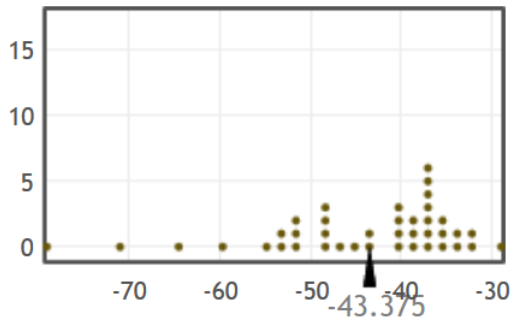
	Number of Events	Number of trials	Proportion
Sample 1	273	760	0.359
Sample 2	198	745	0.266

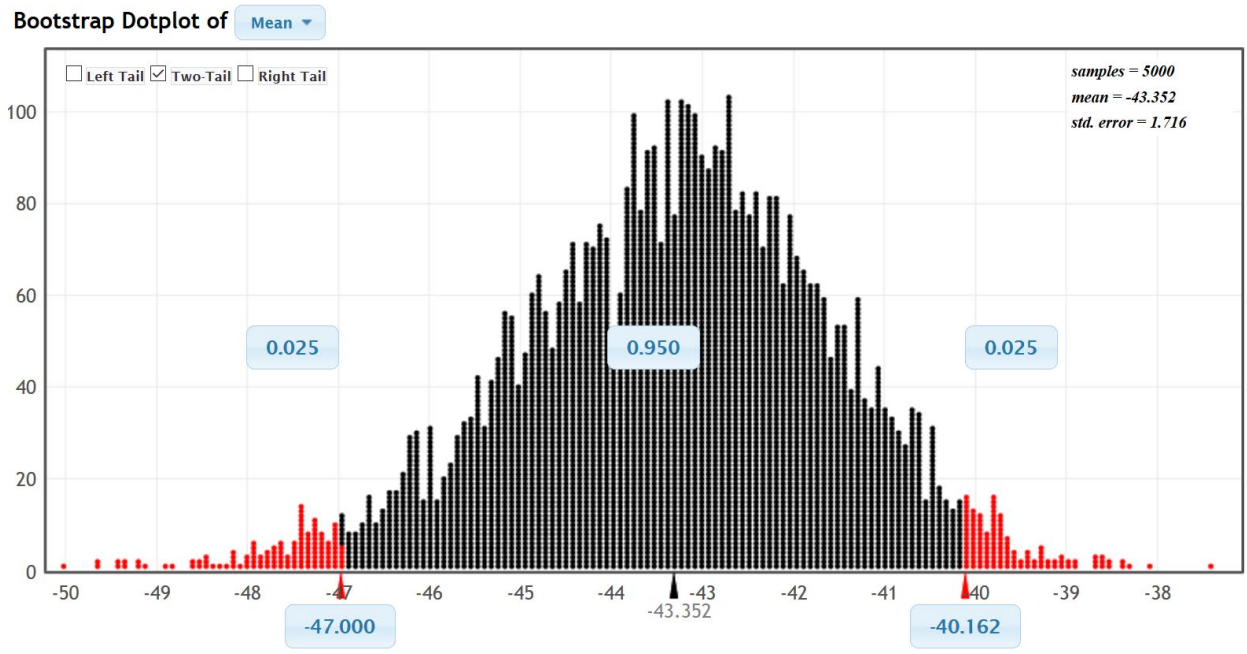
Sample proportion difference = 0.093
Margin of error = 0.039
90.0%CI = (0.0543, 0.1325)

17. We used the random health data at www.matt-teachout.org to compare the population mean average systolic and diastolic blood pressures for female sex assigned at birth. Population 1 was diastolic blood pressure and population 2 was systolic blood pressure. We used StatKey to create the following 95% bootstrap confidence interval of the differences between the matched pairs.

Original Sample

n = 40, mean = -43.375
median = -40, stdev = 10.748





18. An experiment was done to test the effectiveness of medicine that lowers cholesterol. An experiment was conducted and adults were randomly assigned into two groups. The groups had similar in all confounding variables such as ages, exercise patterns and diet. Of the 410 adults in the treatment group, 49 of them showed a decrease in cholesterol. Of the 420 adults in the placebo group, 38 of them showed a decrease in cholesterol. Was the medicine effective in lowering cholesterol? Use the following 99% confidence interval from Statcato to determine if the percentage of people on the medicine that have a decrease in cholesterol (population 1) is higher than the percentage from the placebo group (population 2).

Confidence Interval - Two population proportions: confidence level = 0.99

	Number of Events	Number of trials	Proportion
Sample 1	49	410	0.120
Sample 2	38	420	0.090

Sample proportion difference = 0.029
Margin of error = 0.055
99.0%CI = (-0.0258, 0.0838)

19. Open the Health data at www.matt-teachout.org. Copy and paste the sex assigned at birth data and cholesterol data into a new excel spreadsheet so that they are next to each other. Go to www.lock5stat.com can click on StatKey. Under the Bootstrap Confidence Interval menu, click on "CI for Difference in Means". Under the "edit data" menu, copy and paste the sex assigned at birth and cholesterol data into StatKey. Construct a 95% two-population mean bootstrap confidence interval estimate of the difference between the female sex assigned at birth population mean average cholesterol (μ_1) and the male sex assigned at birth population mean average cholesterol (μ_2).

20. In March 2003, a research group asked 2400 randomly selected Americans whether they believe that the U.S. made the right or wrong decision to use military force in Iraq. Of the 2400 adults, 1862 said that they believed that the U.S. did make the correct decision. In February 2008, the question was asked again to 2180 randomly selected Americans and 684 of them said that the U.S. did make the correct decision. Go to www.lock5stat.com and use StatKey to create a 90% two-population proportion bootstrap confidence interval to compare the population percentage of people that agree with war in 2008 (π_1) and the population percentage in 2003 (π_2).
