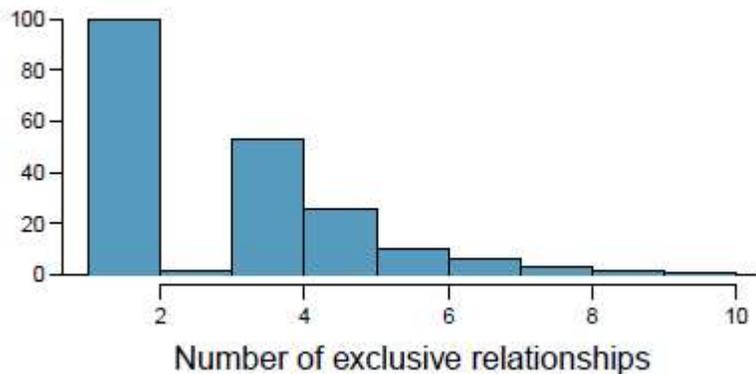




Problem 1⁴

A survey conducted on a reasonably random sample of 203 undergraduates asked, among many other questions, about the number of exclusive relationships these students have been in. The histogram below shows the distribution of the data from this sample. The sample average is 3.2. The standard deviation was previously reported as 1.97.



1. Estimate the average number of exclusive relationships Duke students have been in using a 90% confidence interval and interpret this interval in context. Check any conditions required for inference, and note any assumptions you must make as you proceed with your calculations and conclusions.

Answer: Independence: random sample. We can assume that the students in this sample are independent of each other with respect to number of exclusive relationships they have been in. Notice that there are no students who have had no exclusive relationships in the sample, which suggests some student responses are likely missing (perhaps only positive values were reported). The sample size is at least 30. The skew is strong, but the sample is large so this is not a concern. 90% CI: (2.97, 3.43). We are 90% confident that undergraduate students have been in 2.97 to 3.43 exclusive relationships, on average.

Problem 2⁴

The 2010 General Social Survey asked the question: “After an average work day, about how many hours do you have to relax or pursue activities that you enjoy?” to a random sample of 1,155 Americans.⁴¹ A 95% confidence interval for the mean number of hours spent relaxing or pursuing activities they enjoy was (1.38, 1.92).

2. Interpret this interval in context of the data.

We are 95% confident that Americans spend an average of 1.38 to 1.92 hours per day relaxing or pursuing activities they enjoy.

¹ Math-UOttawa ² UVermont ³ Utts ⁴ OpenIntro



3. Suppose another set of researchers reported a confidence interval with a larger margin of error based on the same sample of 1,155 Americans. How does their confidence level compare to the confidence level of the interval stated above?

Their confidence level must be higher as the width of the confidence interval increases as the confidence level increases.

4. Suppose next year a new survey asking the same question is conducted, and this time the sample size is 2,500. Assuming that the population characteristics, with respect to how much time people spend relaxing after work, have not changed much within a year. How will the margin of error of the 95% confidence interval constructed based on data from the new survey compare to the margin of error of the interval stated above?

The new margin of error will be smaller since as the sample size increases the standard error decreases, will decrease the margin of error.

Problem 3:

A researcher conducted an experiment on 8 randomly selected NASCAR drivers in which their reaction time was measured. The sample mean reaction time was 1.24 seconds. The sample standard deviation reaction time was 0.12 seconds. Assume that reaction time follows a normal distribution.

5. A 98% confidence interval for the population mean reaction time based on these data is given by
- a) 1.24 ± 0.083
 - b) 1.24 ± 0.127
 - c) 1.24 ± 0.099
 - d) 1.24 ± 0.120
 - e) Sample size is too small to construct a confidence interval

Problem 4:

Laura is interested in the mean height of the girls in her 9th grade class year. Assume the population standard deviation is known to be 1.2 inches. She takes a sample of 48 students and calculates a sample mean of 64.5 inches and a sample standard deviation of 0.9.

6. What is the parameter of interest?
- (a) The mean height of the 48 girls in Laura's 9th grade class year.
 - (b) The mean height of girls in Laura's 9th grade class year.
 - (c) The mean height of the girls in Laura's entire school.
 - (d) The mean height of the 48 girls in Laura's entire school.



7. Assume Laura wants to create a 95% confidence interval about the true parameter. What is the margin of error?

- (a) 0.89
- (b) 1.07
- (c) 0.52
- (d) 0.34

Problem 5:

Write the null and alternative hypotheses in words and then symbols for each of the following situations.

- 8. New York is known as “the city that never sleeps”. A random sample of 25 New Yorkers were asked how much sleep they get per night. Do these data provide convincing evidence that New Yorkers on average sleep less than 8 hours a night?
- 9. Employers at a firm are worried about the effect of March Madness, a basketball championship held each spring in the US, on employee productivity. They estimate that on a regular business day employee spend on average 15 minutes of company time checking personal email, making personal phone calls, etc. They also collect data on how much company time employees spend on such non- business activities during March Madness. They want to determine if these data provide convincing evidence that employee productivity decreases during March Madness.

4.17 (a) $H_0 : \mu = 8$ (On average, New Yorkers sleep 8 hours a night.)

$H_A : \mu < 8$ (On average, New Yorkers sleep less than 8 hours a night.)

(b) $H_0 : \mu = 15$ (The average amount of company time each employee spends not working is 15 minutes for March Madness.)

$H_A : \mu > 15$ (The average amount of company time each employee spends not working is greater than 15 minutes for March Madness.)

Problem 5:



Write the null and alternative hypotheses in words and then symbols for each of the following situations.

10. New York is known as “the city that never sleeps”. A random sample of 25 New Yorkers were asked how much sleep they get per night. Do these data provide convincing evidence that New Yorkers on average sleep less than 8 hours a night?
11. Employers at a firm are worried about the effect of March Madness, a basketball championship held each spring in the US, on employee productivity. They estimate that on a regular business day employee spend on average 15 minutes of company time checking personal email, making personal phone calls, etc. They also collect data on how much company time employees spend on such non- business activities during March Madness. They want to determine if these data provide convincing evidence that employee productivity decreases during March Madness.

Problem 6:

12. The nutrition label on a bag of potato chips says that a one ounce (28 gram) serving of potato chips has 130 calories and contains ten grams of fat, with three grams of saturated fat. A random sample of 35 bags yielded a sample mean of 134 calories with a standard deviation of 17 calories. Is there evidence that the nutrition label does not provide an accurate measure of calories in the bags of potato chips? We have verified the independence, sample size, and skew conditions are satisfied

4.23 $H_0 : \mu = 130$. $H_A : \mu \neq 130$. $Z = 1.39 \rightarrow$
p-value = 0.1646, which is larger than $\alpha = 0.05$.
The data do not provide convincing evidence
that the true average calorie content in bags of
potato chips is different than 130 calories.