CONFIDENCE INTERVAL HOMEWORK

TEXT: 8.2, 8.3

LAST NAME	FIRST NAME	DATE

1. Suppose that a statistician collects a simple random sample of 500 registered US voters, and constructs a 90% confidence interval for the proportion of registered voters who are in favor of the legislation that reduces the duration of copyright:

$$(0.40, 0.48)$$

Which one of the following is the best interpretation of this result?

(a) 90% of the surveyed registered voters are in favor of reducing the duration of copyright.
(b) The proportion of voters who are in favor of a shorter copyright term is definitely somewhere between 40% and 48%.
(c) If many such samples were taken, then about 90% of them would contain the actual population proportion of voters who favor reducing the duration of copyright.
(d) The voters are 40% to 48% confident that the duration of copyright if way too long.

2. Insurance companies are interested in knowing the population percent of drivers who always buckle up before riding in a car. When designing a study to determine this population proportion, what is the minimum number of drivers you would need to survey to be 95% confident that the population proportion is estimated to within 0.03?

In a telephone poll of 1,200 adult Americans, one of the questions asked was "What is the main problem facing the country?" 256 of the surveyed individuals answered "crime". We are interested in the population proportion of adult Americans who feel that crime is the main problem.

3. Construct a 95% confidence interval for the population proportion of adult Americans who feel that crime is the main problem using the exact binomial method.

4. Use the sample data to estimate the minimal sample size required to obtain a 95% confidence interval, if the margin of error should be no greater than 1%.

A random sample of public 4-year universities in California yields the following data for the annual tuition in 2023:

Institution	Annual Tuition, USD
Cal Poly Pomona	7,439
UC Berkeley	31,026
UCLA	13,258
CSU Chico	7,864
San Diego State	8,174
UC Santa Barbara	14,617

Same data in copy-paste friendly format:

7439, 31026, 13258, 7864, 8174, 14617

While answering the following questions, you may assume that the population distribution is approximately normal.

5. Find the point estimate for the mean annual tuition.

6. Find the 98% confidence interval for the mean annual tuition using the t distribution.

7. What is the margin of error for your confidence interval estimate?

8. If we increase the sample size, and keep the confidence level the same, will the margin of error for our estimate increase or decrease?

9. Find the minimal sample size required to obtain a 90% confidence interval for the mean annual tuition, if the margin of error should be no larger that $1000.

10. In a sample of 28 russet potatos, the mean weight is 1.27 lb and the standard deviation of the weight is 0.12 lb. Find an 80% confidence interval for the population mean weight of a russet potato.

$\alpha =$ $t_{\alpha/2,n-1} =$

MOE = 80% CI:

11. ACME Insurace research suggests that the average cost of car repair in California is between \$384 and \$438, with 80% confidence. Find the point estimate for the average cost of car repair in California as well as the margin of error.

$\overline{x} =$ MOE =

12 (†)**.** Use the "Random Article" feature of Wikipedia to construct a 90% confidence interval for the proportion of articles about specific persons, with the margin of error of about 10%. An article qualifies if it is named after a real (not imaginary) person or persons who are its main subject.

$x =$ $n =$

Lower MOE: Upper MOE:

90% CI:

13 (†)**.** Construct a numerical sample of size $n = 2$ with mean 10 and standard deviation $\sqrt{2}$.

14. Consider the popualation of all Wikipedia articles. Think of four different variables you could meausure objectively, with an automated process, something like *the number of words in an article*.

(a) Nominal:

(b) Ordinal:

(c) Discrete:

(d) Continuous:

Now think of four different variables that would be difficult to measure objectively, or really hard to automate (without some kind of AI), such as *whether the article is about a real person*.

(a) Nominal:

(b) Ordinal:

(c) Discrete:

(d) Continuous:

Answers

1. (c)

2. 1068, using $\left\lceil \frac{1}{4}\left(\frac{z_{\alpha/2}}{E}\right)^2 \right\rceil$

3. (0.1904635, 0.2376170)

4. 6447, using $\left\lceil \hat{p}(1-\hat{p})\left(\frac{z_{\alpha/2}}{E}\right)^2 \right\rceil$

5. 13729.67

6. (1365.866, 26093.468)

7. 12363.8

8. Decrease.

9. 220, using $\left\lceil \left(\frac{z_{\alpha/2} \cdot s}{E}\right)^2 \right\rceil$