

AP Statistics Practice Free Response Test – Chapter 8: Estimating with Confidence

- A 2005 report by the American Management Association summarized the results of an extensive survey given to 526 randomly selected U.S. businesses. One of the questions asked was whether the company had fired any employees for misuse of the Internet while at work. The report gave a confidence interval of .229 to .292 for the proportion of all U.S. companies that have fired employees for misuse of the Internet while at work.

 - What proportion of the businesses in the sample had answered yes to this question?
 - What was the margin of error for this interval?
 - Explain to someone who does not know anything about statistics why we can't simply say that the answer to part (a) is true for all U.S. businesses.
- A random sample of 1100 teenagers (ages 12 to 17) was asked whether they played games online; 775 said that they did.

 - Verify that the conditions are met here for inference about a population proportion p .
 - Construct and interpret a 99% confidence interval for the population proportion p .
 - How large a sample would you need to take to estimate p within 2% at a 99% confidence level? Use \hat{p} for the value of p^* . Show your work.
- Rocky Mountain Airlines Flight 441 flies from Denver to Albuquerque each day at 8:00 am. The flight is listed as taking 58 minutes, on average. A random sample of 9 of these flight times, rounded to the nearest minute, is given in the table below.

56	62	59	58	60	57	59	61	62
----	----	----	----	----	----	----	----	----

- Construct a 95% confidence interval for the true mean flight time for Flight 441.
- Does the interval in (a) give you reason to suspect that the claim of 58 minutes is false? Explain.
- What concern do you have about the data used here to construct the confidence interval in part (a)? Explain.

AP Statistics Practice Free Response Test – Chapter 8: ANSWERS

1 – (a): Need to find \hat{p} , which is the midpoint of the interval: $\hat{p} = \frac{.229 + .292}{2} = .2605$

1 – (b): Margin of Error is half the width of the interval: $ME = \frac{.292 - .229}{2} = .0315$

1 – (c): The sample results describes only the 526 businesses in the survey. If we selected another 526 businesses and asked the same question, results would vary. We don't know the actual proportion for all businesses - that is why the margin of error is so important. It gives us a range of values that the true proportion is almost certainly to lie within.

2 – (a): **SRS** – sample was random

Normality – 775 successes and 325 failures; both are easily greater than 10

Independence – The population of teenagers in the U.S. is much greater than 10 times the sample size (11,000)

2 – (b): **Interval** = $.705 \pm 2.576 \sqrt{\frac{(.705)(.295)}{1100}} = .66911$ to $.73998$

Interpretation: We can be 99% confident that the true proportion of teenagers that play games online is between 66.9% and 74.0%.

2 – (c): $n = (.705)(.295)(2.576/.02)^2 = 3450.189$, so round up to **3451**.

3 – (a): With 95% confidence and $df = 9 - 1 = 8$, $t^* = 2.306$. The sample mean for these times is 59.333. The sample standard deviation is 2.121.

So the interval is $59.333 \pm 2.306(2.121/\sqrt{9}) = 57.703$ to 60.964

(note that your interval may be slightly different, depending on how you rounded)

3 – (b): Since 58 is contained in the interval (barely), we have to assume they are correct. They might be wrong, but the interval does not give us reason to believe they are.

3 – (c): Since the sample size is so small, we must assume that the data comes from a distribution that is close to normal. If it does not, then our interval may not be accurate.