AP Stats Confidence Interval Practice!

Congress is confident

1) According to the American Community Survey, a 95% confidence interval for the median household income in Statsland during 2009-2011 was $58,929 ± $218. Interpret the confidence interval and confidence level using the sentence frames below:

Confidence Interval

We are **95%** confident that the interval from **$58,711** to **$59,147** captures the **true** median income for households in Statsland.

Confidence Level

If **many** **random** samples **of the same size** of Statsland households were selected, the resulting confidence intervals would **capture** the **true** median income for households in Statsland for about **95%** of those samples.

2) A large company is concerned that many employees are in poor physical condition, which can result in decreased productivity. The company provides a pedometer to 50 randomly-selected employees to use for one 24-hour period. After collecting the data, the company reports a 95% confidence interval of 4547 steps to 8473 steps.
   a) Interpret the confidence interval
   b) What is the point estimate and margin of error?
   c) Is there convincing evidence that employees are meeting the 10,000 steps-per-day guidelines?

a) I am 95% confident that the true mean amount of steps per day was captured within 4547 and 8473 steps.

b) $8473 - 4547 = \dfrac{3926}{2} = 1963$

$8473 - 1963 = 6510$

6510 ± 1963 steps

c) No, there is not convincing evidence that employees are meeting their steps because 10,000 steps per day is not within the 95% CI of 4547 to 8473 steps.

3) How much does the fat content of Brand X hot dogs vary? To find out, researchers measured the fat content (in grams) of a random sample of 10 Brand X hot dogs. A 95% confidence interval for the population standard deviation is 2.84 to 7.55.

I am 95% confident that the true SD for fat content was captured within 2.84 and 7.55 g.

    a) Interpret the confidence interval
    b) Interpret the confidence level
    c) True or false? The interval from 2.84 to 7.55 has a 95% chance of containing the actual population standard deviation. Justify your answer.

b) ✓ Approximately 95% of CIs calculated from SRSs of the same size would capture the true SD of fat content.

c) False. Once an interval has been calculated, the probability that the true SD of fat content has been captured is either 0 or 1. This is a prior event. Probabilities of events occuring in the past are 0 (did not occur). or 1 (did occur).

4) As part of a project about response bias, a group from Mr. B's stats class surveyed a random sample of 25 students from Gunn. One of the questions in the survey required students to state their GPA. Based on the responses, the group is 90% confident that the interval from 3.14 to 3.52 captures the mean GPA for all students. *Approx. 90% of CIs calculated from SRSs of the same size would capture the true mean GPA.*

    a)   Interpret the confidence level
    b)   What would happen to the length of the interval if the confidence level were increased to 99%.
    c)   How would a 90% confidence interval based on a sample size of 200 compare to the original 90% interval?
    d)   Describe a potential source of bias in the survey that's not accounted for in the margin of error.

✓ b) The interval would be wider (longer length).
c) The interval would be narrower (shorter length).
d) Response bias. Students may not have been honest about their GPAs in the survey.

Bonus Challenge!
Suppose you want to rent a one-bedroom apartment in North Carolina next year. The mean monthly rent for a random sample of 60 apartments advertised on Craigslist is $1000. Assume a population standard deviation of $200. How large a sample of one-bedroom apartments above would be needed to estimate the population mean within plus or minus $50 with 90% confidence? Hint: the ~~multiplier~~ *critical value* for a 90% confidence interval is 1.645.