Name: _____ Date: _____

PSTAT 5A: Homework 4

Summer Session B 2025, with *Annie Adams*

1. The U.S. Department of Housing and Urban Development defines a person or household to be “rentburdened” if 30% or more of the individual/household’s income is spent on housing. A recent survey revealed that 42% of households in a representative sample of 150 households were rent-burdened.

   (a) Define the parameter of interest.

   (b) Define the random variable of interest.

   (c) Construct a 95% confidence interval for the true proportion of rentburdened households, and interpret your interval in the context of this problem.

(d) Would you expect an 80% confidence interval for the true proportion of rent burdened households to be wider or narrower than the 95% confidence interval you constructed in part c? Explain briefly.

2. In a particular iteration of PSTAT 5A, scores on the final exam had an average of 89 and a standard deviation of 40. The exact distribution of scores is, however, unknown. Suppose a representative sample of 100 students is taken, and the average final exam score of these 100 students is recorded.

(a) Identify the population.

(b) Identify the sample

(c) Define the parameter of interest, using the correct notation.

(d) Define the random variable of interest, using the correct notation.

(e) What is the sampling distribution of the random variable you defined in part above? Be sure to check any conditions that might need to be checked!

3. Meta recently launched the social media app Threads. As the new resident Data Scientist for Meta's Santa Barbara division (congratulations!), you would like to determine the true proportion of Santa Barbara residents that have made a Threads account. Your supervisor believes that 47% of all Santa Barbara residents have made a Threads account; in a representative sample of 120 residents, however, you observe that only 48 of these sampled individuals have made a Threads account. You would like to use your data to test your supervisor's claims against a two-sided alternative, at a 5% level of significance.

(a) Define the parameter of interest.

(b) Define the random variable of interest.

(c) State the null and alternative hypotheses in terms of our parameter of interest.

(d) What is the observed value of the test statistic?

(e) What distribution does the test statistic follow, assuming the null is correct?

(f) What is the critical value of the test?

(g) Conduct the test and phrase your conclusion in the context of the problem .