

Name : _____

Directions: This exam contains four problems worth a total of 100 points. For each computational problem, you must first write the formula to be used and present all your subsequent work in order to receive full or partial credit. Circle your final answers.

1. The lifetime of a 100-watt light bulb is modeled by a certain distribution with a mean of 750 hours and a standard deviation of 750 hours. According to this model, many light bulbs last relatively short and a small number of bulbs last long. Thus, the distribution is positively skewed. You have just purchased fifty 100-watt bulbs for your office building. Assume that these bulbs constitute a random sample.
 - (a) What will the approximate distribution of the mean lifetime of the 50 bulbs be, and what theorem assures such a result? (10 pts.)

 - (b) Compute the probability that the mean lifetime of the 50 bulbs will exceed 1,000 hours. (15 pts.)

2. Twist-off caps are very common for bottled drinks these days. However, many consumers are concerned about the cleanliness of the contents of the bottles (i. e., bottles can easily be opened before a customer purchases them). To address this issue, a major beer company intends to conduct a survey, and if they determine that more than 75% of all consumers have the concern, they will switch back to using regular caps.
 - (a) If the company wishes their estimate of the proportion of the customers with the concern to be within .06 of the true value with 95% certainty, how many customers should they survey? Do not use any information from (b) below to answer this question. (10 pts.)

 - (b) Suppose that the survey was conducted with 250 customers, and that 195 of them said that they were concerned about twist-off caps. Construct a 95% confidence interval for the true proportion. (15 pts.)

3. A study was conducted to test whether the mean thickness of spearmint gum manufactured for vending machines was 7.50 hundredths of an inch. The mean thickness based on a random sample of 50 gums was 7.52. The standard deviation of the thickness is known to be 0.10.

(a) At the significance level of .10, conduct a test of hypotheses to determine whether the true mean thickness differs from 7.50 hundredths of an inch. (15 pts.)

H_0 : _____ vs. H_a : _____

Compute the test statistic and define the rejection rule.

Should the null hypothesis be rejected? Circle one. Yes No

(b) Compute the observed significance level of the test conducted in (a). (10 pts.)

4. The time that elapses from the emergency call till the arrival of the first police car to the crime scene was measured for a random sample of 24 cases in a city. The mean response time was 213 seconds with a standard deviation of 26.

(a) Use a 99% confidence interval to estimate the true mean response time. (15 pts.)

(b) Interpret the confidence interval obtained in (a) in the context of the problem. (5 pts.)

(c) Refer to (a) above. Would a 95% confidence interval be narrower or wider, assuming that everything else stayed the same? (5 pts.)