

Name: _____

Directions: This exam contains seven 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. A university conducted a campus-wide survey about smoking habits. The results, based on a random sample of 511 students, were that 19.7% were “regular smokers,” 10.4% were “occasional smokers,” and the remaining 69.9% were “nonsmokers.” Estimate the true proportion of occasional smokers at this university using a 99% confidence interval. (12 pts.)

2. A local realtor claims that the mean price of all townhouses in its city is 84500 dollars. To test the truth of this claim, the prices for 30 townhouses selected at random were obtained. The mean price was 84800 dollars with a standard deviation of 1100. What conclusion should be reached, allowing a Type I error rate of .01? (14 pts.)

H_0 : _____ vs. H_a : _____

Compute the test statistic and approximate the p -value.

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

3. A middle-school student wishes to figure out the probability of the head for his bent coin. He will toss this coin a large number of times and calculate the proportion of times heads are observed. How many times should he toss the coin in order for his estimate of the proportion to be within .04 of the true value with 90% certainty? (10 pts.)
4. An animal scientist intends to estimate the mean length (in meters) of a particular species of a snake. She will obtain a random sample of the snakes of this species and calculate the mean length. How large a sample should she take to ensure that the estimated mean is off the true value by no more than 0.03 meter with 95% confidence? Assume that the standard deviation of the length is approximately 0.14 meter. (10 pts.)
5. The time it takes for a car to reach 60 mph from a dead stop (0-to-60 time) is a commonly used measure of the performance of the car. For 61 compact cars selected at random, the mean 0-to-60 time was 7.89 seconds with a standard deviation of 0.62.
- (a) Construct a 95% confidence interval for the true mean 0-to-60 time for all compact cars. (12 pts.)
- (b) What does the confidence interval obtained in (a) tell you about the claim that the mean 0-to-60 time for all compact cars is 8.00 seconds? Explain. (10 pts.)

6. The local government of a suburb near a large city reported that the distribution of the household income (in dollars) was quite skewed with mean $\mu = 42100$ and standard deviation $\sigma = 570$. Suppose that you take a random sample of $n = 45$ residents in this suburb and compute the mean household income.
- (a) What distribution will the sample mean household income have? Give the name of the distribution. What theorem assures such a result? (6 pts.)
- (b) What is the probability that the sample mean income will be higher than 42000 dollars? (12 pts.)
7. The result of a national survey revealed that 82.4% of the 863 Americans believed in life after death. Assuming that the respondents of this survey constitute a random sample, conduct a test to determine whether the true proportion of the Americans believing in life after death is less than .85. Use a significance level of .10. (14 pts.)

H_0 : _____ vs. H_a : _____

Compute the test statistic and calculate the p -value.

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