

Name: _____

Directions: This exam contains five 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 box of paperclips manufactured by a certain company says, "Contains approximately 100 paperclips." A high school student wanted to estimate the mean number of paperclips contained in the box. He selected a random sample of 20 boxes and counted the actual numbers of paperclips. He observed a sample mean of 103.10 with a standard deviation of 2.02. Assume that the number of paperclips can be characterized as having a normal distribution.

- (a) Form a 95% confidence interval for the true mean number of paperclips contained in the box. (12 pts.)

- (b) Based on your answer in (a), can you conclude that the true mean number of paperclips contained in the box is greater than 100? Explain. (10 pts.)

- (c) If the student wants to be 95% sure that his estimate of the mean number of paperclips is off of the true value by no more than 0.5, how many boxes should he observe? (10 pts.)

2. The administrators of a college claim that less than 30% of their students are regular smokers. According to a survey conducted with a random sample of 250 students at this college, 72 of them stated that they were regular smokers. Test the truth of the claim at a significance level of .01. (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

3. As part of the routine quality control, a company who manufactures athletic socks took a random sample of 750 pairs of socks for inspection from its production line. The company discovered that, of the 750 pairs, 18 were defective.

(a) Construct a 90% confidence interval for the true proportion of defective pairs of socks. (12 pts.)

(b) If the company wishes its estimate of the proportion of defective pairs of socks to be within .01 of the true value with 95% certainty, how many pairs of socks should the company inspect? (10 pts.)

4. A motorcycle manufacturer claims that the average fuel efficiency of its light-weight motorcycles is 60.0 miles/gallon. To determine whether this claim is reasonable, a consumer group measured the fuel efficiencies for 30 light-weight motorcycles (treat these 30 motorcycles as a random sample). The consumer group observed a sample mean of 56.2 miles/gallon with a standard deviation of 10.3. What conclusion should be reached, allowing a Type I error rate of .10? (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

5. The actual weight of a 5-pound bag of potatoes has a mean weight of 5.08 pounds with a standard deviation of 0.06. Suppose that you take a random sample of 30 bags of potatoes and calculate the sample mean weight.

(a) What distribution does the sample mean weight have? (6 pts.)

(b) What is the probability that the sample mean weight will be greater than 5.05 pounds? (12 pts.)