

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. As part of the routine quality control, a company that produces household paints measured the concentrations of the paint for a randomly selected twenty 10-gallon containers from its production line. The mean concentration was 1.16 g/cm^2 with a standard deviation of 0.17. Assume that the distribution of the concentration measure is approximately normal.
 - (a) With an alpha level of .01, conduct a test of hypotheses to determine whether the mean concentration of the paint differs from 1.10 g/cm^2 . (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) Construct a 99% confidence interval for the true mean concentration of the paint. (10 pts.)
 - (c) The confidence interval in (b) *should* contain 1.10. Explain why this is so in relation to what you concluded for the test in (a). (5 pts.)

2. It is claimed that 75% of all dentists recommend a certain brand of gum for their gum-chewing clients. To examine the truth of this claim, a consumer group surveyed 390 dentists chosen at random and found that 273 of them recommended this brand of gum.
- (a) Construct a 95% confidence interval for the true proportion of the dentists who recommend this brand of gum. (10 pts.)

 - (b) In order for the 95% confidence interval in (a) to be no wider than .08, how large a sample must be taken? (10 pts.)
3. The length of a particular species of an eel is approximately normally distributed with mean $\mu = 61.0$ centimeters and standard deviation $\sigma = 4.0$. A random sample of 20 eels of this species will be taken and the mean length will be computed.
- (a) What will the mean of the sample mean lengths be? (5 pts.)

 - (b) What will the standard deviation of the sample mean lengths be? (5 pts.)

 - (c) Calculate the probability that the sample mean length will be greater than 60.0 centimeters. (15 pts.)

4. Based on a random sample of size 30, the mean diameter of the trunk of a particular type of a 50-year-old coniferous tree was found to be 35.0 inches. Assume that the standard deviation of the diameter is known to be 4.0 inches.

(a) At a significance level of .05, test the truth of the conjecture that the mean diameter of the trunk of this type of tree is larger than 33.0 inches. (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) Regardless of what you actually computed, suppose that the test statistic for the test in (a) was $z^* = 2.75$. Calculate the p -value of the test. (10 pts.)