Advanced Statistics Chapter 9 Quiz review 2 Name :

1. The mean time it takes for a person to experience pain relief from aspirin is 25 minutes. A new ingredient is added to speed up relief. Let μ denote the mean time to obtain pain relief with the new product, An experiment is conducted to verify if the new product works more quickly. What are the null and alternative hypotheses for the appropriate test of significance?

   (A) $H_o: \mu = 25, H_a: \mu \neq 25$

   (B) $H_o: \mu = 25, H_a: \mu < 25$

   (C) $H_o: \mu < 25, H_a: \mu = 25$

   (D) $H_o: \mu < 25, H_a: \mu > 25$

   (E) $H_o: \mu = 25, H_a: \mu > 25$

2. A test of $H_o: \mu = 60$ against $H_a: \mu \neq 60$, produces a sample mean of 58 and a P-value of 0.04. Which of the following is true at the 0.05 level of significance ?

   (A) There is sufficient evidence to conclude that $\mu < 60$

   (B) There is sufficient evidence to conclude that $\mu = 60$

   (C) There is insufficient evidence to conclude that $\mu = 60$

   (D) There is insufficient evidence to conclude that $\mu \neq 60$

   (E) There is sufficient evidence to conclude that $\mu \neq 60$

3. Which of the following statements regarding inference procedures for a population mean is true ?

I The data should be a simple random sample of size n, drawn from the population

II When using a t-distribution, we generally assume the data are drawn from a population that has a normal distribution

III We use a t-distribution when the population standard deviation is unknown

(A) I only

(B) II only

(C) III only

(D) I and III only

(E) I, II and III

4. We want to test $H_o: \mu = 1.5$ against $H_a: \mu \neq 1.5$ at $\alpha = 0.05$. A 95% confidence interval for μ, calculated from a given random sample is (1.4,3.6). based on this finding we

(A) Fail to reject H_o.

(B) Reject H_o

(C) Cannot make any decision at all because the value of the test statistic is not available.

(D) Cannot make any decision at all because the distribution of the population is unknown.

(E) Cannot make any decision at all because (1.4,3.6) is only a 95% confidence interval for μ .

5. A researcher wishes to test the following hypothesis :

$$H_o : \mu = 100$$

$$H_a : \mu < 100$$

If the population mean is actually 95, but the researcher concludes that the mean is 100, what type of error has occurred ?

(A) Type I error

(B) Type II error

(C) Standard error of the mean

(D) No error has occurred

(E) The data does not provide enough information to determine the type of error.

6. Textbook authors must be careful that the reading level of their book is appropriate for the target audience. Some methods for assessing reading level requires estimating the average word length. We have randomly chosen 20 words from a selected page in "Stats : Modeling the World " and counted the number of letters in each word :

5 , 5 , 2 , 1 , 1, 1, 5 , 3 , 8 , 5 , 4 , 7 , 2 , 9 , 4 , 8 , 10 , 4,5 , 6 , 6

(a) Suppose that your editor was hoping that the book would have a mean word length of 6.5 letters. Does this sample indicate that the authors failed to meet this goal ? Test an appropriate hypothesis and state your conclusion.

(b) For a more definitive evaluation of reading level, the editor wants to estimate the text's mean word length to within 0.5 letters with 98% confidence. How many randomly selected words does she need to use ?

7. "Red Tide" is a bloom of poison-producing algae – a few different species of a class of plankton called dinoflagellates. When water and weather conditions cause these bloom, shellfish such as clams living in the area develop dangerous levels of a paralysis-inducing toxin. In Massachusetts, the Division of Marine Fisheries (DMF) monitors levels of the toxin in shellfish by regularly sampling of shellfish along the coastline. If the mean level of toxin in clams exceeds 800 μg (micrograms) of toxin per kg of clam meat in any area at a 5% level of significance, clam harvesting is banned there until the bloom is over and levels of toxin in clams subside. During a bloom, the distribution of toxin levels in clams on a single mudflat is distinctly non-Normal.

(a) Define the parameter of interest and state the appropriate hypotheses for the DMF to test.

(b) Because of budget constraints and the large number of coastal areas that must be tested, the DMF would like to sample no more than 10 clams from any single area. Explain why this sample size may lead to problems in carrying out the significance test from (a).

(c) Describe a Type I and a Type II error in this situation and the consequences of each.

(d) The DMF is considering changing the significance level of the test to 10%. Discuss the impact this might have on error probabilities and the power of the test and describe the practical consequences of this change.

TOTAL : /30