Midterm 2

answers

Instructions: Refer to the provided probability tables as necessary. You may use a calculator, and one sheet of notes. You will never be penalized for showing work, but if what is asked for can be computed directly, points awarded will depend primarily on the correctness of your numerical answer. Each question and subquestion is worth 4 points. As there are 21 total questions, the exam is out of 84 points, so you get 16 points for free. Good luck!

Problem 1 Suppose an interval estimate for the population mean was 62.84 to 69.46. The standard deviation is $\sigma = 13.5$, and a sample of size $n = 34$ was used. The mean of the sample was:

a. 6.62

b. 56.34

c. 62.96

D. 66.15

Problem 2 Alice's interval estimate for a population mean is 50.92 ± 2.14. She had assumed that the population standard deviation is $\sigma = 10$. If, instead, σ were equal to 20, the interval estimate would be:

a. 60.92 ± 2.14

b. 50.92 ± 12.14

c. 101.84 ± 4.28

D. 50.92 ± 4.28

Problem 3 If the confidence level is reduced, the confidence interval:

a. widens

b. remains the same

C. narrows

d. disappears

Problem 4 A 99% confidence interval estimate of the population mean μ can be interpreted to mean:

a. if all possible sample are taken and confidence intervals created, 99% of them would include the true population mean somewhere within their interval.

b. we have 99% confidence that we have selected a sample whose interval does include the population mean.

c. we estimate that the population mean falls between the lower and upper confidence limits, and this type of estimator is correct 99% of the time.

D. All of the above are true.

Problem 5 To estimate the mean of a normal population whose standard deviation is 6, with a bound on the error of estimation equal to 1.2 and confidence level of 99% requires a sample size of at least:

A. 166

b. 167

c. 13

d. None of these choices

Problem 6 The sample size needed to estimate a population mean to within 10 units was found to be 68. If the population standard deviation was 50, then the confidence level used was:

a. 99%

b. 95%

C. 90%

d. None of these choices

Problem 7 Which of the following conclusions is not an appropriate conclusion from a hypothesis test?

a. Reject H_0. Sufficient evidence to support H_1.

b. Fail to reject H_0. Insufficient evidence to support H_1.

C. Accept H_0. Sufficient evidence to support H_0.

d. All of these choices are true.

Problem 8 In a criminal trial, a type I error is made when:

a. a guilty defendant is acquitted

B. an innocent defendant is convicted

c. a guilty defendant is convicted

d. an innocent defendant is acquitted

Problem 9 If a hypothesis test has a type I error probability of .05, this means that:

a. if the null hypothesis is true, we will fail to reject 5% of the time.

B. if the null hypothesis is true, we reject it 5% of the time.

c. if the null hypothesis is false, we fail to reject it 5% of the time.

d. if the null hypothesis is false, we reject it 5% of the time.

Problem 10 Which of the following p-values will lead us to reject the null hypothesis if $\alpha = .05$?

a. .15

b. .1

C. .04

d. More than one of the above is true.

Problem 11 In a one-tailed hypothesis test, the p-value is .068. Had the test been two-tailed, the p-value would have been:

a. .932

b. .466

c. .034

D. .136

Problem 12 A 95% confidence interval for μ is $[10, 25]$. What conclusion will we make if we test $H_0 : \mu = 26$ against $H_1 : \mu \neq 26$ with $\alpha = .025$?

a. Reject H_0 in favor of H_1.

b. Reject H_1 in favor of H_0.

c. Fail to reject H_0 in favor of H_1.

D. There not enough information to tell.

Problem 13 The owner of a local nightclub has recently surveyed a random sample of n = 300 customers of the club. She would now like to determine whether or not the mean age of her customers is over 35. If so, she plans to alter the entertainment to appeal to an older crowd. If not, no entertainment changes will be made. Suppose she found that the sample mean was 35.5 years and the population standard deviation was 5 years. What is the p-value associated with the test statistic?

a. .9582

b. 1.73

C. .0418

d. .0836

Problem 14 If the probability of committing a Type I error for a given test is decreased, then for a fixed sample size n, the probability of committing a Type II error will:

a. decrease

B. increase

c. stay the same

d. There not enough information to tell.

Problem 15 For a given α, if the sample size increases, the probability of a type II error will:

a. remain the same

b. increase

C. decrease

d. There not enough information to tell.

Problem 16 A market researcher is interested in studying the incomes of consumers in a particular region. The population standard deviation is known to be \$1,000. A random sample of 50 individuals resulted in an average income of \$15,000. Give a 98% confidence interval estimate for average income.

$[\$14,671, \$15,329]$, or $\$15,000 \pm \$329$.

Problem 17 Bob tells you that his estimate for the mean of a population is $[95.5, 102.5]$. The population standard deviation is known to be $\sigma = 14$, and Bob arrived at his estimate from a sample of size $n = 49$ with $\bar{x} = 99$. What confidence level is Bob using?

The text of the question contained an error during the exam; $\bar{x}$ was not given as 99. Reasonable answers in light of this will receive some credit. In the correct version of the question (given above), the answer is 92%.

Problem 18 A production filling operation has a historical standard deviation of 6 ounces. When in proper adjustment, the mean filling weight for the production process is 50 ounces. A quality control inspector periodically selects at random 36 containers and uses the sample mean filling weight to see if the process is in proper adjustment.

a. State appropriate null and alternative hypotheses.

$H_0 : \mu = 50$. $H_1 : \mu \neq 50$.

b. Suppose that the sample mean is 48.6 ounces. Give the p-value of your test in part a.

.162

Problem 19 A researcher claims viewers spend an average of 40 minutes per day watching the news. You think the average is higher than that. In testing your hypotheses $H_0 : \mu = 40$ vs. $H_1 : \mu > 40$, the following information came from your random sample of viewers: $\bar{x} = 42$ minutes, $n = 25$. Assume $\sigma = 5.5$, and $\alpha = 0.10$.

a. Determine the p-value of the test.

.0345

b. Interpret the p-value. What does it tell you?

A p-value of .0345 says that for any *alpha* $\geq .0345$, H_0 would be rejected. It is the minimum value of α for which we would reject H_0 in favor of H_1.