

Practice Exam 3 – STCC204

The following are the types of questions you can expect on Exam 3. There are 24 questions on this practice exam, so it should give you a good indication of the length of the exam. On Exam 3 the 25th question will be “Turn in your crib sheet with your exam paper”. With only 24 questions, it is not possible to address all of the topics we covered. You need to study your other assignments and lecture notes to be sure you have studied adequately. Note: Copies of the F-distribution, t-distribution and standard normal distribution will be provided with the exam.

1. Whenever using the t distribution in hypothesis testing, we must assume that the
 - a. sample size is at least 30
 - b. sampling distribution is approximately normal
 - c. distribution of the population is approximately normal
 - d. finite population correction factor is necessary
 - e. None of the above answers is correct.

2. As the number of degrees of freedom for a t distribution increases, the difference between the t distribution and the standard normal distribution
 - a. becomes larger
 - b. becomes smaller
 - c. stays the same
 - d. None of the above answers is correct.

3. Which of the following is **not** a required assumption for analysis of variance?
 - a. The random variable of interest for each population has a normal probability distribution.
 - b. The variance associated with the random variable must be the same for each population.
 - c. At least 4 populations are under consideration.
 - d. All of the above are required assumptions.

1. The following analysis of variance table was obtained for testing whether the means of four populations are equal.

Source	DF	SS	MS	F	P
Factor	3	6750	2250	4.50	0.018
Error	16	8000	500		
Total	19	14750			

Based on the ANOVA table, the null hypothesis should

- a. be rejected at the .05 significance level
 - b. not be rejected at the .05 significance level
 - c. It is impossible to determine the decision from the above information.
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5. The manager of a grocery store has taken a random sample of 100 customers in order to test the hypotheses $H_0: \mu \leq 3$ versus $H_a: \mu > 3$, where μ is the mean waiting time in the checkout line for all customers at the grocery store. The p-value was computed to be 0.0228. At the .05 significance level, it can be concluded that the mean of the population is
 - a. greater than 3
 - b. not greater than 3
 - c. significantly less than 3
 - d. significantly greater than 3.18

 6. The average life expectancy of tires produced by the Whitney Tire Company has been 40,000 miles. Management believes that due to a new production process, the life expectancy of its tires has increased. In order to test the validity of this belief, the correct set of hypotheses is
 - a. $H_0: \mu < 40,000$ $H_a: \mu \geq 40,000$
 - b. $H_0: \mu \leq 40,000$ $H_a: \mu > 40,000$
 - c. $H_0: \mu > 40,000$ $H_a: \mu \leq 40,000$
 - d. $H_0: \mu \geq 40,000$ $H_a: \mu < 40,000$

7. For testing the hypotheses $H_0: \pi \leq .75$ versus $H_1: \pi > .75$, we obtain $n = 100$ and $p = .80$. Determine the p-value for the test.
- 0.1251
 - 0.05
 - 0.025
 - 0.3749
 - .2502
8. A Type II error is committed when
- a false null hypothesis is not rejected
 - a true null hypothesis is mistakenly rejected
 - the sample size has been too small
 - not enough information has been available
 - None of the above answers is correct.
9. For a sample of size 50, the following hypotheses are being tested at a significance level of .01.
- $$H_0: \mu \geq 100$$
- $$H_a: \mu < 100$$
- The null hypothesis will be rejected if the test statistic Z is
- > 2.58
 - > 2.33
 - < -2.33
 - < 100
 - None of the above answers is correct.
10. For the following hypothesis testing situation:
- $$n = 36 \quad \bar{x} = 24.6 \quad s = 12 \quad H_0: \mu \leq 20$$
- $$H_a: \mu > 20$$
- The value of the test statistic is
- 2.3
 - 0.38
 - 2.3
 - 0.38
 - None of the above answers is correct.
11. Salary information for a random sample of male and female employees of a large company is shown below.
- | | <u>Male</u> | <u>Female</u> |
|---------------------------------|-------------|---------------|
| Sample Size | 64 | 36 |
| Sample Mean Salary (in \$1,000) | 44 | 41 |
| Sample Variance | 128 | 72 |
- If you are interested in testing whether or not the average salary of males is significantly greater than that of females, the test statistic is
- 2.0
 - 1.5
 - 1.96
 - 1.645
 - None of the above answers is correct.
12. An ANOVA procedure is used for data obtained from four populations. Four samples, each comprised of 30 observations, were taken from the four populations. The numerator and denominator (respectively) degrees of freedom for the critical value of F are
- 3 and 30
 - 4 and 30
 - 3 and 119
 - 3 and 116
 - None of the above answers is correct.

13. An analysis of variance is being run with 6 numerator and 60 denominator degrees of freedom. For $\alpha = .05$, the decision rule is
- Reject H_0 if $F > 3.74$
 - Reject H_0 if $F > 2.25$
 - Reject H_0 if $F > 2.37$
 - Reject H_0 if $F < 2.25$
 - None of the above answers is correct.
14. Suppose a utility company wants to test the null hypothesis that the average electrical consumption is at most 50 kilowatt hours per day for a certain residential area. The appropriate hypotheses for this test are $H_0: \mu \leq 50$, $H_1: \mu > 50$. The p-value for the test is .2300. Based on the p-value, we should say that
- We do not have evidence that H_0 is false.
 - We have some evidence that H_0 is false.
 - We have strong evidence that H_0 is false.
 - We have very strong evidence that H_0 is false.
 - We have extremely strong evidence that H_0 is false.
15. The average mileage of a certain model of minivan is stated to be 21.0 miles per gallon (mpg) for city driving. A consumer group tests the claim $H_0: \mu = 21.0$ by driving a sample of 25 cars and determining the gas mileage for each over a three week period. The sample resulted in a 95% confidence interval of 18.24 mpg to 20.56 mpg for the population mean. Based on this information, what can be said regarding the decision for the hypothesis test?
- We should reject H_0 at the .05 significance level.
 - We should not reject H_0 at the .05 significance level.
 - We should reject H_0 at the .10 significance level.
 - We should not reject H_0 at the .10 significance level.
 - None of the above is correct.
16. The average cost of tuition, room and board at small private liberal arts colleges is reported to be \$8,500 per term, but a financial administrator believes that the average cost is higher. A study was conducted using a sample of 150 small liberal arts colleges. The Minitab output below was obtained. Let $\alpha = 0.05$.
- ```
Test of mu = 8500.0 vs mu > 8500.0
The assumed sigma = 1200
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- | Variable | N   | Mean   | StDev  | SE Mean | Z    | P     |
|----------|-----|--------|--------|---------|------|-------|
| Cost Per | 150 | 8708.9 | 1180.2 | 98.0    | 2.13 | 0.017 |
- Based on the Minitab output, the conclusion should be
- the average cost is higher than \$8,500.
  - the average cost is lower than \$8,500.
  - the average cost is equal to \$8,500.
  - the average cost is equal to \$8,708.90.
  - None of the above can be concluded.
17. Suppose a t-test is used to test  $H_0: \mu \geq 212$  versus  $H_1: \mu < 212$ . The level of significance selected is 0.01 and sample size is 26. What is the critical value?
- 2.580
  - 2.485
  - 1.960
  - 2.479
  - None of the above

18. A hypothesis test is conducted to test  $H_0: \mu_1 = \mu_2$ . The degrees of freedom for the hypothesis test is 24, which one of the following is NOT true about the two sample sizes?
- $n_1 = 11; n_2 = 13$
  - $n_1 = 12; n_2 = 14$
  - $n_1 = 13; n_2 = 13$
  - $n_1 = 10; n_2 = 16$
19. A nationwide survey of college students was conducted and found that students spend two hours per class hour studying. A professor at your college wants to determine whether the time students spend at your college is different from two hours. A random sample of fifteen statistics students is obtained and the findings are given below. The t-test is to be conducted at the 5% level of significance.

Test of  $\mu = 2.0000$  vs  $\mu \text{ not } = 2.0000$

| Variable | N  | Mean   | StDev  | SE Mean | T     | P    |
|----------|----|--------|--------|---------|-------|------|
| Hours    | 15 | 1.9080 | 0.2053 | 0.0530  | -1.74 | 0.10 |

The appropriate conclusion is

- The mean at your college is different from two hours.
  - The mean at your college is less than two hours.
  - The mean at your college is greater than two hours.
  - None of the above can be concluded.
20. **Test at the 0.01 level the statement that 55% of those families who plan to purchase a vacation residence in Florida want a condominium. The null hypothesis is  $\pi = 0.55$  and the alternate is  $\pi$  is not equal to 0.55. A random sample of 400 families who planned to buy a vacation residence revealed that 228 families want a condominium. A 99% confidence interval for  $\pi$  was computed to be .506 to .634. What decision should be made regarding the null hypothesis?**
- Do not reject it
  - Reject it
  - Cannot make a decision based on the information given
21. If an ANOVA test is conducted and the null hypothesis is rejected, what does this indicate?
- Too many degrees of freedom
  - No difference between the population means
  - At least one population mean is different from the others
  - None of the above
22. A manufacturer of automobile transmissions uses three different processes. The management ordered a study of the production costs to see if there is a difference among the average costs for the three processes. The appropriate hypotheses to be tested are
- $H_0: \mu_1 = \mu_2 = \mu_3$  and  $H_1: \mu_1 \neq \mu_2 \neq \mu_3$
  - $H_0: \mu_1 = \mu_2 = \mu_3$  and  $H_1$ : All of the means are not equal.
  - $H_0: \mu_1 = \mu_2 = \mu_3$  and  $H_1$ : Not all of the means are equal.
  - None of the above.

23. A member of an insurance consumers organization wants to compare the mean annual yearly expenditures for homeowner's insurance for two areas. A sample of 11 homes from the Denver area and a random sample of 13 homes from the Kansas City area were used for the study. The following information resulted:

|             | Sample Mean | Sample Standard Deviation |
|-------------|-------------|---------------------------|
| Denver      | 487         | 37                        |
| Kansas City | 396         | 25                        |

What is the appropriate test statistic for the hypothesis test?

- F with 11 and 13 degrees of freedom
  - F with 10 and 12 degrees of freedom
  - t with 22 degrees of freedom
  - t with 23 degrees of freedom
  - t with 24 degrees of freedom
24. Consider a population of ten-pound bags of flour shipped last week by a manufacturer. A consumer advocate group will use a statistical test to determine whether the average weight of the population of bags is greater than 10 pounds. What is  $H_1$ ?
- $\mu \geq 10$
  - $\mu < 10$
  - $\bar{x} < 10$
  - $\bar{x} \geq 10$
  - $\mu > 10$

Answers: 1.c, 2.b, 3.c, 4.a, 5.a, 6.b, 7.a, 8.a, 9.c, 10.a, 11.b, 12.d, 13.b, 14.a, 15.a, 16.a, 17.b, 18.a, 19.d, 20.a, 21.c, 22.c, 23.c, 24.e