Sample Exam 3 - STAT 303 Session 201

Summer 2009

Name:

UIN:

Signature:

1. Do not open this test until told to do so.
2. Turn in your exam with your answers circled when you are done with the exam. You should not take the exam with you.
3. This is a closed book examination. You may use one both-sided sheet of formulas that you have brought with you. You should have no other printed or written material with you on the exam.
4. You have 60 minutes to work on this exam. There are 16 multiple choice questions and 4 work out questions, each worth 5 points.
5. You may use a calculator but not a phone during the exam.
6. If you are unsure of what a question is asking for, do not hesitate to ask the instructor or course assistant for clarification.
7. Do not sit directly next to another student.
8. Good Luck!!!

1. Suppose we are trying to test $H_0 : \mu = 3$ vs. $H_A : \mu \neq 3$, where μ is the average number of children a woman thinks a family should have. If we get a 95% confidence interval of (3.3,4.1). What conclusion is appropriate?

   (a) There is significant evidence that the average number of children a woman thinks a family should have is 3.

   (b) There is not significant evidence that the average number of children a woman thinks a family should have is 3.

   (c) **There is significant evidence that the average number of children a woman thinks a family should have is not 3.**

   (d) There is not significant evidence that the average number of children a woman thinks a family should have is not 3.

   (e) None of the above.

2. Using the three confidence intervals below, what is the correct range of the p-value when testing $H_0 : \mu = 23$ vs. $H_A : \mu \neq 23$?

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90% (23.139, 26.861)
95% (22.783, 27.127)
99% (22.086, 27.914)
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   (a) p-value > 0.10

   (b) **0.10 > p-value > 0.05**

   (c) $0.05 >$ p-value > 0.01

   (d) p-value < 0.01

   (e) You need a test statistic value to determine the p-value

3. We want to test $H_0 : \mu = 60$ vs. $H_A : \mu > 60$. We get a sample of 50 and find the mean to be 55.3. From a previous study we know that the standard deviation is 12.8, what are the value of the test statistic and the resulting p-value?

   (a) z = 2.60 and the p-value = 0.9953

   (b) **z = -2.60 and the p-value = 0.9953**

   (c) z = 2.60 and the p-value = 0.0047

   (d) z = -2.60 and the p-value = 0.0047

   (e) z = 2.60 and the p-value = 0.0094

4. Suppose we want to test $H_0 : \mu = 60$ vs. $H_A : \mu > 60$ and the resulting p-value is 0.089. Which of the following is the correct conclusion?

   (a) We would reject at the 10% level and conclude that the true mean is more than 60.

   (b) We would fail to reject at the 5 and 1% levels and conclude that the true mean is not more than 60.

   (c) We would fail to reject at the 5 and 1% levels and conclude that the true mean is no more than (less than) 60.

   (d) **A and B are correct conclusions.**

   (e) A and C are correct conclusions.

5. Which of the following would be a Type I error for the test above?

   (a) **The true mean is 50 and we conclude that it is more than 60.**

   (b) The true mean is 70 and we conclude that it is more than 60.

   (c) The true mean is 70 and we fail to prove it is more than 60.

   (d) The true mean is 50 and we fail to prove it is more than 60.

   (e) The true mean is 70 and we fail to prove it is less than 60.

6. Suppose a test of $H_0 : \mu = 0$ vs. $H_A : \mu \neq 0$ is run with $\alpha = 0.05$. The p-value of the test is 0.069. If you were to calculate a 95% confidence interval for μ, would the resulting interval contain 0?

   (a) No, because based on the p-value for the hypothesis test we would fail to reject the null, which means that 0 is not a plausible value for μ.

   (b) No, because based on the p-value for the hypothesis test we would reject the null, which means that 0 is not a plausible value for μ.

   (c) **Yes, because based on the p-value for the hypothesis test we would fail to reject the null, which means that 0 is a plausible value for μ.**

   (d) Yes, because based on the p-value for the hypothesis test we would reject the null, which means that 0 is a plausible value for μ.

   (e) There is not enough information to answer this question.

7. A study of 5,392 people analyzed the relationship between gender and IQ. The subjects of the study were administered an IQ test and scored according to the Wechsler Adult Intelligence Scale. The average IQ for the men in the study was 103, while the average IQ for the women in the study was 101. The p-value for the study was 0.003. Which of the following is true?

   (a) **The study has statistical but not practical significance.**

(b) The study has practical but not statistical significance.

(c) The study has both practical and statistical significance.

(d) The study has neither practical nor statistical significance.

(e) There is not enough information to determine the significance of the study.

8. Suppose a 95% confidence interval for μ is (4.68, 10.92). Which of the following statements is true?

   (a) We are 95% confident that the true mean is 7.8, the center.

   (b) The true mean will be between 4.68 and 10.92 95% of the time.

   (c) We are confident that the true mean will be between 4.68 and 10.92 95% of the time.

   (d) The probability of getting a mean between 4.68 and 10.92 is 95%.

   (e) **None of the above are correct statements about the confidence interval.**

9. Suppose you test $H_0 : \mu_1 = \mu_2$ vs. $H_A : \mu_1 > \mu_2$ and get a test statistic = 2.5. What is the range of the p-value? The statistics from the independent normal samples: $\bar{x}_1 = 15.1$, $s_1 = 3.2$, $n_1 = 6$ and $\bar{x}_2 = 7.4$, $s_2 = 8.5$, $n_2 = 9$

   (a) $0.10 >$ p-value > 0.05

   (b) **$0.05 >$ p-value > 0.025**

   (c) $0.04 >$ p-value > 0.02

   (d) $0.025 >$ p-value > 0.02

   (e) $0.02 >$ p-value > 0.01

10. Suppose in the test above the actual p-value was 0.156. How would you interpret this value?

    (a) The first sample is 15.6% larger(greater than) the second sample.

    (b) If the true means are really equal, we would see a sample means at least this different 15.6% of the time.

    (c) **If the true means are really equal, we would see a sample mean from the first population at least this much bigger than the one from the second 15.6% of the time.**

    (d) If the true means are really different, we would see a sample means at least this different 15.6% of the time.

    (e) If the true means are really different, we would see a sample means at least this different 84.4% of the time.

11. Suppose I need to know whether the true test score is under 70, so I want to test $H_0 : \mu = 70$ vs. $H_A : \mu < 70$. If I sample the same population 50 times and reject (conclude the true mean is under 70) 45 of those times, what does this tell me?

(a) The true mean is probably not under 70 since I didn't reject every time.

(b) The true mean is probably not under 70. The 45 out 50 rejections, 90%, is my sample estimate of α, is too large so I must have made a mistake.

(c) The true mean is probably not under 70. The 5 out 50 rejections, 10%, is my sample estimate of β, the chance of making a Type II error.

(d) The true mean is under 70. The 45 out 50 rejections, 90%, is my sample estimate of α, the chance of making a Type I error.

(e) **The true mean is under 70. The 5 out 50 rejections, 10%, is my sample estimate of β, the chance of making a Type II error.**

12. A 95% confidence interval for the true proportion, p, calculated from the previous data is (0.5167, 0.5713). Which of the following is the best interpretation of this interval?

(a) 95% of the time, the true proportion, p, would fall in this interval.

(b) The probability of the true proportion, p, falling in this interval is 95%.

(c) **We are 95% confodent that the true proportion, p, falls in this interval.**

(d) More than one of the above are correct interpretations.

(e) None of the above are correct interpretations.

13. Which of the following is/are true?

(a) When calculating the sample size for a particular margin of error in a confidence interval for the true proportion, p, we use previous information about its value rather than 0.5 because it will reduce the n needed.

(b) The standard error for a statistic is the estimated standard deviation.

(c) In calculating a z confidence interval for μ, we use the standard error since we don't know the value of the true standard. deviation.

(d) All of the above are true.

(e) **Only two of the above are true.**

14. The National Student Loan Survey asked some of the student loan borrowers about their attitudes toward debt. In particular, they asked "If you could begin again, taking into account your current experience, what would you borrow?" 54.5% said they would borrow less. If the others said they would borrow more, is this really a signi

cant percent, i.e., is it statistically more than half of the sample of 1280 students? What is the value of the test statistic, its p-value and the correct conclusion?

(a) $z = 3.22$**, p-value = 0.0006 Yes, it is statistically significantly more than half.**

(b) $t_{1281} = 3.22$, $0.001 >$ p-value > 0.0005 Yes, it is statistically significantly more than half.

(c) $z = 3.23$, p-value $= 0.0006$ Yes, it is statistically significantly more than half.

(d) $z = 3.22$, p-value $= 0.0012$ Yes, it is statistically significantly more than half.

(e) $t_{1281} = 3.22$, $0.002 >$ p-value > 0.001 Yes, it is statistically significantly more than half.

15. If we took a larger sample but got the same sample proportion in the previous problem, we would

(a) **get a smaller p-value.**

(b) get a larger p-value.

(c) get the same p-value since the p-value only depends on the sign of the alternative and we didn't change that.

(d) get wider con

dence intervals.

(e) Two of the above are true.

16. Do people really prefer fresh-brewed coffee over instant? Which of the following would be the best way to test this claim?

(a) take one sample of people who prefer fresh-brewed and compare it to another independent sample of people who prefer instant.

(b) take two independent samples and run a two-sample t-test comparing the number of people who prefer fresh to the number who prefer instant.

(c) take one sample but have each person taste both fresh and instant and run a matched pairs test to see if the number who prefer fresh minus the number who prefer instant is greater than 0.

(d) **take one sample but have each person taste both fresh and instant and run a 1-sample z-test for proportions testing if the proportion of those who prefer fresh is more than half.**

(e) take two independent samples and run a 2-sample z-test for proportions comparing the proportion who claim they prefer fresh to the proportion who claim they prefer instant.

17. Which of the following would be a Type I error for the test above?

(a) claiming that people prefer instant when they prefer fresh-brewed.

(b) claiming that people prefer fresh-brewed when they prefer instant.

(c) **claiming that people prefer fresh-brewed when they don't.**

(d) failing to prove people prefer fresh-brewed when they don't.

(e) failing to prove people prefer fresh-brewed when they do.

18. Sample size affects

    (a) the width of con

        dence intervals.

    (b) the power of the hypothesis test.

    (c) the type of test statistic.

    (d) **All of the above.**

    (e) Two of the above.

19. An insurance company is conducting a study to justify higher rates for males. What type of hypothesis test should they use?

    (a) a 2-sample test of proportions comparing the proportion of males involved in accidents with that of females

    (b) a 2-sample test of means comparing the average number of accidents for males and females

    (c) a 2-sample test of means comparing the average cost of accidents for males and females

    (d) **All of the above would provide helpful information.**

    (e) It doesn't matter, they're going to charge more anyway!

20. A recent study of food portion sizes reported that over a 17-year period the average size of a soft drink increased from 13.1 oz. to 19.9 oz. Is this a statistically significant increase?

    (a) It depends on the sample sizes.

    (b) It depends on the standard deviations.

    (c) It depends on the p-value.

    (d) It depends on all three.

    (e) **It depends on only 2 of the 3.**