

STAT303: Secs 508-510

Fall 2005

Exam #3

Form A

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Name:_____

1. **Don't even open this until you are told to do so.**
2. Be sure to write your instructor's name in the space provided on the scantron and your name beneath.
3. There are 20 multiple-choice questions on this exam, each worth 5 points. There is partial credit. Please mark your answers **clearly** on the scantron. Multiple marks will be counted wrong.
4. You will have 60 minutes to finish this exam.
5. If you are caught cheating or helping someone to cheat on this exam, you both will receive a grade of **zero** on the exam. You must work alone.
6. This exam is worth 100 points, and will constitute 20 of your final grade.
7. Good luck!

1. Suppose we tested $H_0 : \mu_1 = \mu_2$ vs. $H_A : \mu_1 \neq \mu_2$ and got a p -value = 0.06. Which of the following would be true?
 - A. 0 would be in a 95% confidence interval for the difference in means calculated from the same data, but not in a 90%.
 - B. 0 would be in a 90% confidence interval for the difference in means calculated from the same data, but not in a 95%.
 - C. Both μ_1 and μ_2 would be in a 95% confidence interval for the difference in means calculated from the same data, but not in a 90%.
 - D. $\bar{x}_1 - \bar{x}_2$ would be in a 95% confidence interval for the difference in means calculated from the same data, but not in a 90%.
 - E. Two of the above are correct.
2. Rejecting at the 5% significance level means
 - A. $\alpha = 0.5$
 - B. there's a 5% chance that we made a Type I error
 - C. the test is significant 5% of the time
 - D. All of the above are true.
 - E. None of the above are true.
3. A noted psychic was tested for extrasensory perception. The psychic was presented with 200 cards face down and asked to determine if each card were one of five different symbols. The psychic was correct in 50 cases. Assume the 200 trials can be treated as a SRS from the population of all guesses the psychic would make in his lifetime. If π is the true probability that the psychic is correct, which set of hypotheses should we test to see if there is evidence that the psychic is doing better than just guessing (picking any one of the five)?
 - A. $H_0 : \mu = 5$ vs. $H_A : \mu > 5$
 - B. $H_0 : \pi = 0.5$ vs. $H_A : \pi \neq 0.5$
 - C. $H_0 : \pi = 0.25$ vs. $H_A : \pi > 0.25$
 - D. $H_0 : \pi = 0.2$ vs. $H_A : \pi > 0.2$
 - E. $H_0 : \pi = 0.2$ vs. $H_A : \pi < 0.2$
4. Instead of just guessing, let's compare the psychic with a proven psychic who regularly gets half of the trials (cards) correct. Which of the following would be the best test to use?
 - A. a 1-sample t -test since we don't know the true standard deviation but our sample is large enough to assume the mean is normally distributed
 - B. a paired t -test comparing their scores on each trial (card)
 - C. a 2-sample proportions using $n = 200$ for both so the normal approximation holds
 - D. a 2-sample t -test since our sample is large but we can't assume the standard deviations are the same
 - E. a pooled t -test since it makes sense that the standard deviations would be quite similar
5. Whichever test we did, say the **alternative** was that the new guy was not a psychic (was worse than the proven psychic). Which of the following would be a Type II error?
 - A. We claim the new guy is a true psychic when he actually isn't one.
 - B. We claim the new guy isn't a true psychic when he actually is one.
 - C. We fail to prove the new guy is a psychic when he actually is one.
 - D. We fail to prove the new guy isn't a psychic when he actually isn't one.
 - E. We fail to prove the new guy isn't a psychic when he actually is one.
6. What does *statistically significant* mean?
 - A. It means the null hypothesis was rejected.
 - B. It means the p -value was small.
 - C. It may not mean there's any practical significance.
 - D. All of the above are true.
 - E. A and B are true.
7. How can we reduce our chance of making a Type II error?
 - A. by reducing α
 - B. by increasing our sample size, n
 - C. by knowing if H_0 is rejected or not
 - D. All three will reduce β
 - E. Only two of the above will reduce β

- 90% CI: (0.1997, 0.3003)
 95% CI: (0.190, 0.310)
 99% CI: (0.172, 0.329)
8. What is the correct range of the p -value for testing $H_0 : \pi = 0.20$ vs. $H_A : \pi \neq 0.20$ given the three confidence intervals for π above?
- A. $p\text{-value} > 0.10$
 B. $0.10 > p\text{-value} > 0.05$
 C. $0.05 > p\text{-value} > 0.01$
 D. $p\text{-value} < 0.01$
 E. You need a test statistic value to determine the p -value
9. Suppose we were testing $H_0 : \pi \leq 0.20$ vs. $H_A : \pi > 0.20$ with different data than the previous problem and got a p -value = 0.12. Which of the following would be the correct conclusion?
- A. Since $0.12 < 0.20$, we reject H_0 and conclude the true proportion is greater than 20%.
 B. 20% is larger than even $\alpha = 10\%$, so we would fail to reject and claim that there's not enough evidence to conclude the true proportion is greater than 20%.
 C. 12% is larger than even $\alpha = 10\%$, so we would fail to reject and claim that there's not enough evidence to conclude the true proportion is greater than 20%.
 D. 20% is larger than even $\alpha = 10\%$, so we would fail to reject and claim that the true proportion is less than or equal to 20%.
 E. We would conclude that the true proportion is 12%, not 20%.
10. Which of the following is the best interpretation of the p -value = 0.12 in the previous problem? Assume the sample proportion $p = 25\%$.
- A. 25% of the time we would get sample proportions of 12% or more even though the true proportion is 20%.
 B. 12% of the time we would get sample proportions of 25% or more even though the true proportion is 20%.
 C. 12% of the time we would get sample proportions of 25% even though the true proportion is more than 20%.
 D. 20% of the time we would get sample proportions of 12% or more even though the true proportion is 25%.
 E. 12% of the time we would reject H_0 even though the true proportion is not more than 20%.
11. Suppose we test $H_0 : \mu = 10$ vs. $H_A : \mu \neq 10$ with a sample of size 16 and got $t = 2.6$. Which of the following is the correct range of the p -value for our test?
- A. $0.005 > p\text{-value} > 0.0025$
 B. $0.01 > p\text{-value} > 0.005$
 C. $0.02 > p\text{-value} > 0.01$
 D. $0.04 > p\text{-value} > 0.02$
 E. $0.05 > p\text{-value} > 0.04$
12. What's the advantage of using a pooled t -test?
- A. There is no advantage. Just because you pool the standard deviations, you still don't know σ .
 B. By assuming the variances are equal we get more data.
 C. By assuming the variances are equal we get a better estimate of σ .
 D. By assuming the variances are equal we get a bigger t statistic.
 E. Everyone knows that pooling your resources saves money.
13. Suppose p_{for} is the proportion of voters who voted for Proposition A and $p_{against}$ is the proportion who voted against it. If we created 95% confidence intervals for the true proportion of voters in favor and against Proposition A (not just the ones who voted), which of the following would be correct?
- A. The confidence intervals would have the same width, just different centers.
 B. The confidence intervals would have the same centers, but different widths.
 C. The confidence intervals would look the same since it's the same data.
 D. The confidence intervals would be totally different since one is for and the other against.
 E. We can't create both from the same data.
14. Which of the following would maximize the power of a test?
- A. using the largest α you can tolerate
 B. using the largest sample size you can afford
 C. using the paired t -test if possible
 D. All of the above.
 E. Only two of the above.

15. So who's really cheaper, Sears or Lowe's? By staying with one store, you get a 'loyalty' discount, so you want to know which store to shop at. How should you figure it out?
- price multiple items of matching brands at both stores and run a paired t -test on the differences in prices
 - go on two separate shopping expeditions, buying various items, and run a 2-sample t -test to see which one saved you more
 - go on two separate shopping expeditions, buying various items, and run a 2-sample z -test for proportions comparing the proportion of discounted items at each store
 - go on two separate shopping expeditions, buying the same items, and run a pooled t -test since the standard deviations should be the same since your using the same item data
 - forget them both and go to Wal-Mart
16. Say Mom and Dad **always** shop at Sears, so you're inclined to also, but you'll switch to Lowe's if it's really cheaper. If $H_0 : \mu_{Sears} = \mu_{Lowe's}$, what alternative should you use if you want to save money?
- $H_A : \mu_{Sears} \neq \mu_{Lowe's}$ because you don't know which one is cheaper
 - $H_A : \mu_{Sears} > \mu_{Lowe's}$ because you want to prove your folks wrong
 - $H_A : \mu_{Sears} < \mu_{Lowe's}$ because you'll only stay with Sears if it's really cheaper
 - $H_A : \mu_{Sears} > \mu_{Lowe's}$ because you'll switch to save money
 - Who cares, Mom and Dad are buying.
17. Say we went with $H_A : \mu_{Sears} \neq \mu_{Lowe's}$ (don't worry, this has nothing to do with the correct answer in the last problem). If we failed to reject, which of the following would be true?
- Sears actually costs more than Lowe's on average.
 - Sears actually costs less than Lowe's on average.
 - Sears and Lowe's actually cost the same on average.
 - There's not a true difference in the average cost at Sears and Lowe's.
 - None of the above are correct.
18. Will you really get more for your iPod if you use the 'Buy Now' option on eBay? You gather data to test $H_0 : \mu_{buynow} = \mu_{bidonly}$ vs. $H_A :$
- $\mu_{buynow} > \mu_{bidonly}$. You get a p -value = 0.04. What's your conclusion?
- 4% of the time, you'll get more money by using the 'Buy Now' option.
 - 10% of the time, you'll reject H_0 and use the 'Buy Now' option.
 - At the 10% level of significance, the 'Buy Now' option gets more money.
 - At the 5% level of significance, the 'Buy Now' option loses money.
 - Two of the above are correct.
19. For the problem above, what is the best reasoning for picking an α level?
- A Type I error is worse since you'd go with the 'Buy Now' option but actually lose money, so you'd use a large α .
 - A Type II error is worse since you'd go with the 'Buy Now' option but actually lose money, so you'd use a large α .
 - A Type II error is worse since you wouldn't go with the 'Buy Now' option even though you could have made more money, so you'd use a large α .
 - A Type I error is worse since you'd go with the 'Buy Now' option but actually lose money, so you'd use a small α .
 - A Type I error is worse since you'd go with the 'Buy Now' option but not make more money, so you'd use a small α .
20. Given $H_0 : \pi = 0.5$ vs. $H_A : \pi \neq 0.5$, a sample proportion, $p = 0.4$ and $n = 75$. What is the correct test statistic and p -value for this test?
- 1.73 and 0.9582
 - 1.77 and 0.0384
 - 1.77 and 0.0768
 - 1.73 and 0.0418
 - 1.73 and 0.0836
- 1A,2E,3D,4C,5D,6D,7B,8A,9C,10B,11D
12C,13A,14D,15A,16D,17E,18C,19C,20E