STAT303 Sec 508-510
Fall 2009
Exam #3
Form A

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1. **Don't even open this until you are told to do so.**
2. There are 20 multiple-choice questions on this exam, each worth 5 points. There is partial credit. Please mark your answers **clearly**. Multiple marks will be counted wrong.
3. You will have 60 minutes to finish this exam.
4. If you have questions, please write out what you are thinking on the back of the page so that we can discuss it after I return it to you.
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 the 15% of your course grade.
7. When you are finished please make sure you have marked your CORRECT section (Tuesday 12:45 is 508, 2:20 is 509, and 3:55 is 510) and FORM and 20 answers, then turn in JUST your scantron to the correct pile for your section.
8. Good luck!

1. Which of the following is true?

   A. You should use a larger α, say 0.10, if you want to reduce the chance of a Type II error.
   B. The smaller α-level you use, the more evidence you need to reject the null.
   C. When using a confidence interval to decide whether to reject or not in a 2-sample test, the 'hypothesized value' is always 0.
   D. All of the above are true.
   E. Only two of the above are true.

2. Suppose I have a 95% confidence interval for the true mean, μ, $(-0.26, 1.53)$. If I wanted to test $H_0 : \mu = 2$ vs. $H_A : \mu \neq 2$, which of the following would be true.

   A. I would fail to reject at the 5% level since 0 is in the 95% confidence interval.
   B. I would reject at the 5% level since 2 is not in the 95% confidence interval.
   C. I would fail to reject at the 1% level since 2 would be in the 99% confidence interval.
   D. All of the above are correct.
   E. Only two of the above are correct.

3. Tennis elbow is thought to be aggravated by the impact experienced when hitting the ball. The article "Forces on the Hand in the Tennis One-Handed Backhand" (*Int. J. of Sport Biomechanics* (1991): 282-292) reported the force (N) on the hand just after impact on a one-handed backhand drive for a random sample of six advanced players and six intermediate players. The authors of the article assumed in their analysis of the data that both force distributions (advanced and intermediate) were normal but nothing else. They want to determine whether the mean force after impact is greater for advanced tennis players than it is for intermediate players. What type of test should the authors use for their analysis?

   A. a 1-sample t-test testing the intermediate players average with the true average of the advanced players
   B. a 2-sample t-test testing the intermediate players average against the advanced players average
   C. a pooled t-test testing the intermediate players average against the advanced players average since it's likely that the standard deviaitons are the same
   D. a pooled t-test testing the intermediate players average against the advanced players average since it's likely that the means are the same
   E. a paired t-test pairing each intermediate player with a similar advanced player

4. Suppose the p-value for the test above was 0.25. How do we interpret this value?

   A. 25% of the time we would see the true mean for advanced players at least this much higher than that of the intermediate players when it really isn't.
   B. 25% of the time we would see the sample mean for advanced players at least this different from that of the intermediate players when there really isn't a difference.
   C. 25% of the time we would see the sample mean for advanced players at least this much higher than that of the intermediate players when the true mean of the advanced really isn't higher.
   D. 25% of the time we would see the sample mean for advanced players at least this different from that of the intermediate players when the true mean of the advanced is really higher.
   E. 25% of the time the advanced players mean will be larger than that of the intermediate players.

5. Still talking about tennis elbow, which of the following would be a Type I error when testing whether the mean force after impact is greater for advanced tennis players than it is for intermediate players?

   A. concluding that you should not become an advanced player since you would be more likely to get tennis elbow
   B. concluding that you should not become an advanced player when it would really be ok
   C. concluding that the better player you are, the more likely you are to get tennis elbow
   D. concluding that you are more likely to get tennis elbow as an advanced player when that's not true
   E. concluding that the mean force after impact is greater for advanced players when it's not

6. Using the information below, what is the correct range of the p-value if I wanted to test $H_0 : \pi_1 = \pi_2$ vs. $H_A : \pi_1 \neq \pi_2$?

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90% (-0.015, 0.215)
95% (-0.037, 0.237)
99% (-0.080, 0.280)
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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. This is a z-test, so we should get an exact p-value.

7. If we fail to reject at $\alpha = 0.05$, then

   A. we would also fail to reject at the 1% level.
   B. we would reject at the 10% level.
   C. we could not make a Type II error.
   D. All of the above are correct.
   E. Only two of the above are correct.

8. I want to prove that girls eat more junk food that boys. If I get a p-value of 0.021, what is my conclusion?
   A. At the 5 and 10% levels I can conclude that girls eat more junk food than boys.
   B. At the 1% level I can conclude that girls don't eat more junk food than boys.
   C. At the 1% level I can conclude that boys eat more junk food than girls.
   D. Two of the above are correct.
   E. None of the above are correct.

9. Which of the following situations for a hypothesis test would be the LEAST likely to make a Type II error?
   A. $n = 100, \alpha = 0.01$
   B. $n = 10, \alpha = 0.05$
   C. $n = 100, \alpha = 0.05$
   D. $n = 1000, \alpha = 0.05$
   E. $n = 10, \alpha = 0.01$

10. When testing $H_0 : \mu_1 \leq \mu_2$ vs. $H_A : \mu_1 < \mu_2$, we get the following statistics: $\bar{x}_1 = 14$, $s_1 = 1.43$, $n_1 = 18$, $\bar{x}_2 = 20$, $s_2 = 4.96$, and $n_2 = 12$. Assuming both populations are normal, what is the range of the p-value if the test statistic is -2.149?
    A. $0.05 > p\text{-value} > 0.025$
    B. $0.025 > p\text{-value} > 0.02$
    C. $0.02 > p\text{-value} > 0.01$
    D. $0.04 > p\text{-value} > 0.02$
    E. $0.10 > p\text{-value} > 0.05$

11. Which of the following is/are true?
    A. The larger the sample size, the more conservative the test, that's why we always round up when calculating sample sizes.
    B. Using 0.5 in the sample size calculation for proportions maximizes n.
    C. Using excessively large samples could cause non-practical significance.
    D. All of the above are true.
    E. Only two of the above are true.

12. In the test $H_0 : \pi = 0.5$ vs. $H_A : \pi \neq 0.5$, I get a p-value of 0.064. Which of the following is/are true?
    A. 0.064 would be in a 95 and 99% confidence interval for the true proportion, π.
    B. 0.064 would not be in a 90% confidence interval for the true proportion, π.
    C. 0.5 would be in a 90% confidence interval for the true proportion, π.
    D. 0.5 would not be in a 95 nor 99% confidence interval for the true proportion, π.
    E. None of the above are true.

13. Which of the following is true?
    A. We should always use a paired t-test since it is the most powerful of the 2-sample t-tests.
    B. Pooling estimates (statistics) makes them less biased.
    C. We should always use the largest sample we can get.
    D. All of the above are true.
    E. None of the above are true.

14. The article "The Sorority Rush Process: Self-Selection, Acceptance Criteria, and the Effect of Rejection" (*J. of College Student Development* (1994): 346-353) reported on a study of factors associated with the decision to rush a sorority. Fifty women who rushed a sorority and 50 women who did not were asked how often they drank alcoholic beverages. For the sorority rush group, the mean was 2.72 drinks per week and the standard deviation 0.86. For the group who did not rush, the mean was 2.11 and the standard deviation 1.02. If the test statistic value was 3.30 for testing if there is a difference between the two groups, what is the range of the p-value?
    A. $0.005 > p\text{-value} > 0.002$
    B. $0.0025 > p\text{-value} > 0.001$
    C. $0.001 > p\text{-value} > 0.0005$
    D. $0.002 > p\text{-value} > 0.001$
    E. $p\text{-value} = 0.001$

15. Suppose our alternative in the scenario above was rushies consume more drinks than non-rushies and our p-value was 0.043. Which of the following is the correct conclusion?
    A. We have insufficient evidence at the 1% level to conclude rushies consume more drinks than non-rushies.
    B. We have insufficient evidence at the 10% level to conclude rushies consume more drinks than non-rushies.
    C. At the 1% level we would conclude that rushies don't drink more than non-rushies.
    D. At the 1% level we would conclude that rushies drink less than non-rushies.
    E. More than one of the above is correct.

16. Suppose a 90% confidence interval for the true proportion, π, is (0.046, 0.251). Which of the following is true?
    A. The true proportion will only be larger than 0.251 5% of the time.
    B. The true proportion will be between 0.046 and 0.251 only 90% of the time.
    C. The true proportion should fall between 0.046 and 0.251 about 90% of the time.
    D. The true proportion may or may not be between 0.046 and 0.251.
    E. None of the above are correct.

17. An Associated Press article (*San Luis Obispo Telegram-Tibune*, Sept. 23, 1995) examined the changing attitudes of Catholic priests. National surveys of priests aged 26 to 35 were conducted in 1985 and again in 1993. The priests surveyed were asked whether they agreed with the following statement: "Celibacy should be a matter of personal choice for priests". In 1985, 69% of those surveyed agreed; in 1993, 38% agreed. Suppose that the samples were randomly selected and that the sample sizes were both 200. What hypotheses should be used to see if attitudes have changed?

    A. $H_0 : \pi_{1993} = 0.69$ vs. $H_A : \pi_{1993} \neq 0.69$
    B. $H_0 : \pi_{1985} \leq \pi_{1993}$ vs. $H_A : \pi_{1985} > \pi_{1993}$
    C. $H_0 : \pi_{1985} = \pi_{1993}$ vs. $H_A : \pi_{1985} \neq \pi_{1993}$
    D. $H_0 : \mu_{1985} = \mu_{1993}$ vs. $H_A : \mu_{1985} \neq \mu_{1993}$
    E. $H_0 : \mu_{1985} \leq \mu_{1993}$ vs. $H_A : \mu_{1985} > \mu_{1993}$

18. Suppose that the previous data produced a p-value = 0.067 (it couldn't have, but let's just suppose). What would happen to the p-value if our sample proportions were 75% and 40% instead? (with the same sample sizes)

    A. Since the sample sizes didn't change, the p-value would stay the same.
    B. Since both proportions increased, the p-value would increase.
    C. Since both proportions increased, the p-value would decrease.
    D. Since the proportions are further apart (75-40 vs. 69-38), the p-value would increase.
    E. Since the proportions are further apart (75-40 vs. 69-38), the p-value would decrease.

19. Which of the following would be a Type II error for testing to see if attitudes of the priests have changed?

    A. failing to prove attitudes have changed when they actually have
    B. failing to see the change in attitudes when it exists
    C. failing to admit there is a change in attitudes when it exists
    D. concluding that there's no change in attitude when one exists
    E. concluding that the change doesn't exist

20. Using the information below, what is the correct range of the p-value if I wanted to test $H_0 : \pi = 0.5$ vs. $H_A : \pi \neq 0.5$?

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90% (0.286, 0.514)
95% (0.264, 0.536)
99% (0.222, 0.578)
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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, 0 isn't in any of the intervals
    E. You need a test statistic value to determine the p-value

1D,2B,3B,4C,5E,6A,7E,8A,9D,10A,11E,
12E,13E,14D,15A,16D,17C,18E,19A,20A