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

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Name:_____

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. 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.
7. Good luck!

1. Suppose you test $H_0 : \mu_1 \leq \mu_2$ 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

2. 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.

3. 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, π, 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.

4. 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 significant 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.

5. A 95% confidence interval for the true proportion, π, 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, π, would fall in this interval.
   B. The probability of the true proportion, π, falling in this interval is 95%.
   C. We are 95% confident that the true proportion, π, falls in this interval.
   D. More than one of the above are correct interpretations.
   E. None of the above are correct interpretations.

6. 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.

7. Using the three confidence intervals below, what is the correct range of the p-value when testing $H_0 : \mu = 8$ vs. $H_A : \mu \neq 8$?

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90% (4.01057, 7.58943)
95% (3.61245, 7.98754)
99% (2.73322, 8.86678)
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   A. p-value > 0.10
   B. $0.10 > p$-value > 0.05
   C. $0.05 > p$-value > 0.01
   D. $0.01 > p$-value
   E. You need a test statistic value to determine the p-value

8. When is the paired t-test preferred over the other two 2-sample tests of means?

   A. It is always preferred, just not always possible.
   B. only when the samples are dependent
   C. only when the standard deviations are similar
   D. only when the samples sizes are equal
   E. only when the means are equal

9. Ok, time for a little humor. Imagine you are the husband of a woman who is eight months pregnant. Your null hypothesis is she's not in labor. Suppose she starts cramping. Which of the following is true?

   A. A type I error would be taking her to the hospital but it's really only gas.
   B. A type II error would be not taking her to the hospital and YOU have to deliver the baby at home.
   C. Since you certainly don't want a type II error, you use a very small α level, *i.e.*, minimal evidence to reject.
   D. All of the above are true.
   E. Only two of the above are true.

10. 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.

11. Suppose you want to test $H_0 : \mu_1 = \mu_2$ vs. $H_A : \mu_1 \neq \mu_2$ but you only have a 95% confidence interval for the difference in the true means of (0.065, 0.187). Which of the following is/are true?

   A. We would reject at the 5 and 1% levels and conclude that the true means are different.
   B. We would fail to reject at the 10% level and state there is insufficient evidence to conclude the true means are different.
   C. We would fail to reject at the 1% level and conclude the true means are the same.
   D. We would fail to reject at the 1% level and state there is insufficient evidence to conclude the true means are the different.
   E. None of the above are true.

12. Why do we 'pool' our estimates?

   A. to use all the information available
   B. we get better statistics (more accurate estimates)
   C. we get more power
   D. All of the above are true.
   E. Only two of the above are true.

13. 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

14. 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

15. 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!

16. Sample size affects

    A. the width of confidence intervals
    B. the power of the hypothesis test
    C. the type of test statistic
    D. All of the above.
    E. Two of the above.

17. Wild hogs are an ever-increasing problem. 225 of the 254 counties in Texas have feral hogs and about half of the national population. (Although the previous information is true, the following is created just for this exam). If the state of Texas can prove that at least 25% of its land has been damaged by hogs, we can get federal funding to combat the problem. Obviously, we can't survey the entire state, so we take a sample. Which set of hypotheses would we test?

    A. $H_0 : \mu_{TX} = \mu_{nation}$ vs. $H_A : \mu_{TX} > \mu_{nation}$, μ is the average damage per acre
    B. $H_0 : \pi_{TX} = \pi_{nation}$ vs. $H_A : \pi_{TX} > \pi_{nation}$, π is the percent of the land damaged
    C. $H_0 : \mu = 0.25$ vs. $H_A : \mu > 0.25$, μ is the average percent of land damaged
    D. $H_0 : \pi = 0.25$ vs. $H_A : \pi > 0.25$, π is the total percent of land damaged
    E. $H_0 : \pi_{TX} = \pi_{nation}$ vs. $H_A : \pi_{TX} \neq \pi_{nation}$, π is the percent of the land damaged

18. Does nutritional education improve one's eating habits? How should we go about testing this question? Suppose there is a national rating scale for eating habits.

    A. We should 'train' a group of people and compare their average rating to the national average.
    B. We should take two large independent samples and compare the average rating of the 'trained' group to the untrained.
    C. We should take two large independent samples and compare the proportion with 'good' eating habits to those with 'bad' habits.
    D. We should take one large sample and compare the average rating before and after 'training'.
    E. We should take one large sample of 'trained' people and see if the proportion with 'good' habits is greater than 50%.

19. Suppose you test $H_0 : \pi = 0.5$ vs. $H_A : \pi \neq 0.5$ and get a p-value = 0.036. Which of the following is/are true?

    A. 0.036 would be in a 99% confidence interval for the true proportion but not in a 90 or 95%.
    B. 0.5 would be in a 90% confidence interval for the true proportion but not in a 95 or 99%.
    C. We would reject at the 5% level and conclude that the true proportion is not 0.036.
    D. Two of the above are correct.
    E. None of the above are correct.

20. 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 confidence intervals.
    E. Two of the above are true.

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