STAT303 Secs 508–510
Fall 2000
Exam #3
Form A

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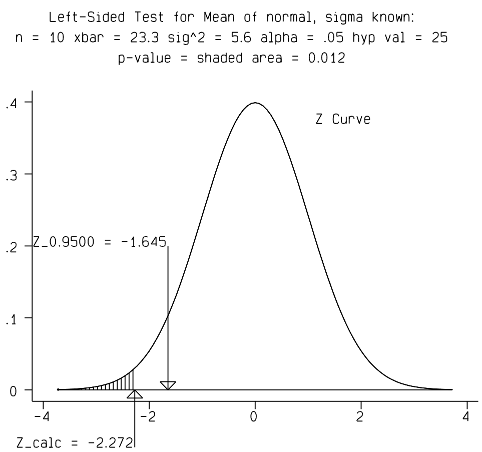
1. **Don't even open this until you are told to do so.**
2. Be sure to write your instructor's name in the space provided and your name beneath.
3. There are 20 multiple-choice questions on this exam, each worth 5 points. There is partial credit. Please mark your answers **clearly** on the exam. Multiple 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 25% of your final grade.
7. Good luck!

1. Which of the following is FALSE?

   A. A p-value is the smallest significance level at which H_0 can be rejected.
   B. A p-value is a measure of the strength of the evidence against the null hypothesis.
   C. A p-value is the probability that the null hypothesis is rejected.
   D. A p-value can be used to perform a test of hypotheses at any significance level.
   E. All of the above are true.



2. Which of the following is a correct conclusion about the test above?

   A. Any any significant level, 10, 5, or 1%, we can conclude that the true mean is not 25.
   B. Any any significant level, 10, 5, or 1%, we can conclude that the true mean is greater than 25.
   C. Any any significant level, 10, 5, or 1%, we can conclude that the true mean is less than 25.
   D. At the 5 and 10% levels, we can conclude the the true mean is not 25.
   E. At the 5 and 10% levels, we can conclude the the true mean is less than 25.

3. The ‘O. J.’ trial is back on t.v., again, a made-for-tv movie even. Assuming, like a large part of the country does (I'm not stating my belief, just using this as a for instance), that O. J. is guilty, what happened when the jury acquitted him? Consider a court trial to be just like a test of hypotheses where one's assumed innocent until proven guilty.

   A. There was too much media attention for the trial to be legitimate.
   B. OJ's too famous to be treated fairly.
   C. There was no error; the conclusion is correct.
   D. a Type I error.
   E. a Type II error.

4. Suppose we want to test whether people are more likely to have both of their feet the same length or not. If we get everyone in the class to measure both of their feet and use that as our data, what type of test should we do?

   A. Case 10: the paired t-test (pairing everyone's left and right foot lengths) and test whether the mean difference is.
   B. Case 8: the pooled t-test since it's likely that the variability of left and right feet is the same.
   C. Case 9: the test for the difference of means since we don't know that the variability of left and right feet is the same.
   D. Case 11: the test for the difference of two proportions and test whether the proportion of people with feet the same lengths is the same as the proportion of people with feet of different lengths.
   E. Either Case 10 or 11 would work.

5. Say instead, we want to know, *of the people with feet that are different lengths*, are you more likely to have your right foot longer than your left. Which set of hypotheses is correct? Note: π_{left} is the proportion of people with their left foot longer than their right and μ_{left} is the true average length of people's left foot.

   A. $H_0 : \pi_{left} = \pi_{right}$ vs. $H_A : \pi_{left} < \pi_{right}$, Case 11
   B. $H_0 : \pi_{right} = 0.5$ vs. $H_A : \pi_{right} > 0.5$, Case 6
   C. $H_0 : \mu_{left} = \mu_{right}$ vs. $H_A : \mu_{left} < \mu_{right}$, Case 9
   D. Either A and B.
   E. Either B and C.

6. When testing a statistical hypothesis, we fail to reject H_0 at the α% level if

   A. H_0 is true.
   B. the hypothesized value under H_0 is less than the sample value.
   C. α is less than the p-value of the test statistic.
   D. All of the above are true.
   E. None of the above are true.

7. In the "Interpreting Confidence Intervals" lab, we saw that if the assumptions of the procedure are violated (*e.g.*, the data is not normal), then

   A. the probability that any confidence interval includes the true parameter will be wrong.
   B. the actual proportion of intervals that don't include the true parameter is not α.
   C. the confidence intervals are too wide.
   D. the confidence interval widths vary too much.
   E. Exactly two of the above are correct.

8. The *power* of a test is

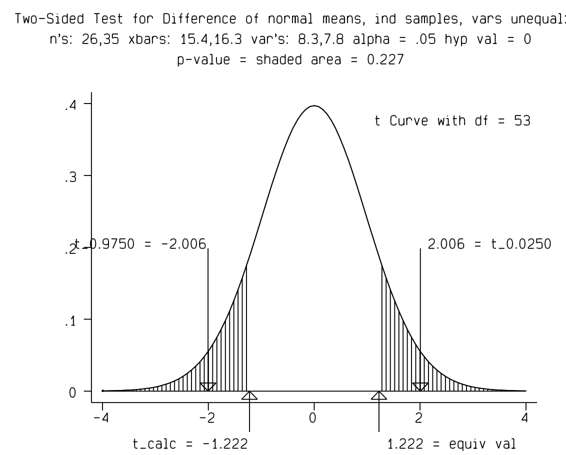
   A. the probability that H_0 is true.
   B. the probability that H_0 is false.
   C. how often we correctly reject H_0.
   D. the probability of rejecting a true H_0.
   E. Exactly two fo the above are correct.

9. A study was done to determine whether taking painkillers before surgery (the experimental group) was more effective than the regular practice of waiting until after to start the pain therapy (the control group). After $9\frac{1}{2}$ weeks, 12 of the 60 men in the experimental group were still feeling pain, and 18 of the 30 in the control group were still feeling pain. Which case should be used?

   A. Case 10: the paired t-test for mean differences, pairing the men with similar pain symptoms.
   B. Case 8: the pooled t-test for the difference of means since it's likely the the variability of the two groups is the same.
   C. Case 7: the ratio of variances test since we always want to reduced the variability of the data.
   D. Case 11: the test for the difference of two proportions
   E. Case 9: the test for the difference of means

10. Which of the following is FALSE?

   A. If I reject at the 5% level, I will always reject at the 10% level.
   B. A z confidence interval is always narrower than a t if $s = \sigma$.
   C. Assuming the data is normal and we are given the population standard deviaiton, we use a t-test if the sample size is small.
   D. The simple random sample assumption is always necessary.
   E. At least two of the above are false.



11. Which of the following is the best interpretation of the p-value of the test above?

   A. 22.7% of the time we will reject the null hypothesis.
   B. If the true means are equal, then the likelihood that we would get sample means this different is 0.227.
   C. If the sample means are equal, then we would conclude that the true means are different 22.7% of the time.
   D. If the true means are equal, then we would conclude that the sample means are different 22.7% of the time.
   E. 22.7% of the time we will get data this extreme.

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CI for Mean of normal, sigma known:
n = 16, sigma^2 = 4, xbar = 11
Lower Limit = 10.177573
Upper Limit = 11.822427   90%

Lower Limit = 10.020018
Upper Limit = 11.979982   95%

Lower Limit = 9.7120853
Upper Limit = 12.287915   99%
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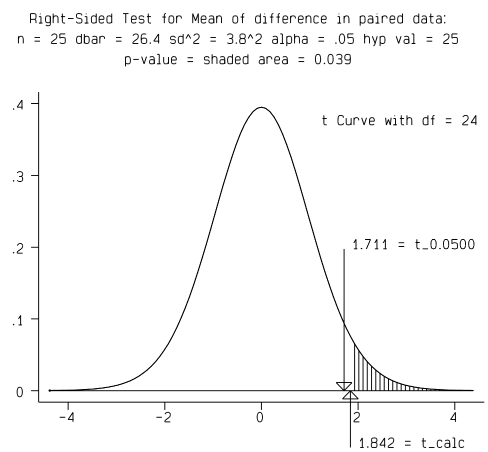
12. Three confidence intervals based on the same data are given above. What is the correct range of the p-value for testing $H_0 : \mu = 11.8$ vs. $H_A : \mu \neq 11.8$?

   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. The sample mean is 11, not 11.8, so we can't use this information.



13. If we had gotten a sample mean difference of 27 instead of 26.4 in the example above, what would be different?

    A. Nothing, the hypotheses and α are not dependent on the data.
    B. The p-value would be larger since 27 is bigger than 26.4.
    C. The p-value would be smaller since 27 is less likely if the true mean is 25.
    D. The mean difference would be greater than 0.039 since 27 is greater than 26.4.
    E. This is a two sample case, so we would need to get 2 sample means.

14. We want to test if sufficient evidence exists that the mean weight of high school football players is different from 225 pounds. Which of the following is the best conclusion at the $\alpha = 0.05\%$ level?

    A. Using a 95% confidence interval for μ: (180,230), we conclude we have sufficient evidence that the true mean weight is different from 225 pounds.
    B. Using a 95% confidence interval for μ: (180,230), we conclude we **don't** have sufficient evidence that the true mean weight is different from 225 pounds.
    C. Using a 90% confidence interval for μ: (190,220), we conclude we have sufficient evidence that the true mean weight is different from 225 pounds.
    D. Using a 90% confidence interval for μ: (190,220), we conclude we **don't** have sufficient evidence that the true mean weight is different from 225 pounds.
    E. It is impossible to test $H_0 : \mu = 225$ using a confidence interval for μ.

15. Suppose the campus Democrats claim that less than half of all Aggies plan to vote Republican in the presidential election (Note: they did this prior to the election). Also suppose that the true percentage of all Aggies who voted Republican was 61%. What kind of error did the campus Democrats make?

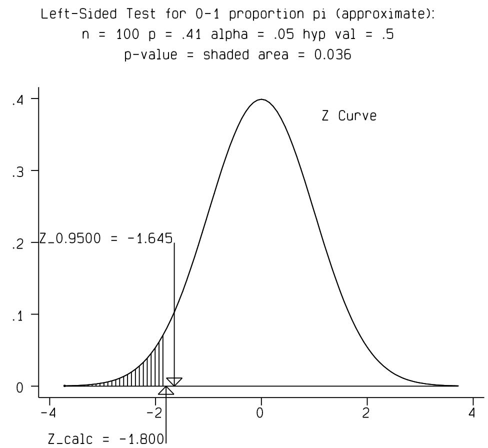
    A. a Type I error
    B. a Type II error
    C. They didn't make an error (*i.e.*, they made a correct decision).
    D. They didn't do their hypothesis test correctly.
    E. They should have waited till after the election since there's no way to know the true proportion.

16. Which of the following BEST describes what 95% confidence means in a 95% confidence interval for μ of (7.8,9.4)?

    A. There is a 95% probability that μ is between 7.8 and 9.4.
    B. In repeated sampling, μ will fall between 7.8 and 9.4 about 95% of the time.
    C. In repeated sampling, $\overline{X}$ will fall between 7.8 and 9.4 about 95% of the time.
    D. In repeated sampling, 95% of the confidence intervals fall between 7.8 and 9.4.
    E. In repeated sampling, the confidence intervals will contain μ about 95% of the time.

17. Which of the following can a hypothesis test NEVER do?

    A. conclude that we have shown that the alternative hypothesis is true
    B. conclude that we have shown that the null hypothesis is true
    C. conclude that we have shown that the alternative hypothesis is false
    D. all of the above
    E. exactly two of the above (excluding D.)



18. The test above had a sample proportion of 41% based on a sample of $n = 100$. What would have happened if we had only taken a sample of 50 instead but still got a sample proportion of 41%?

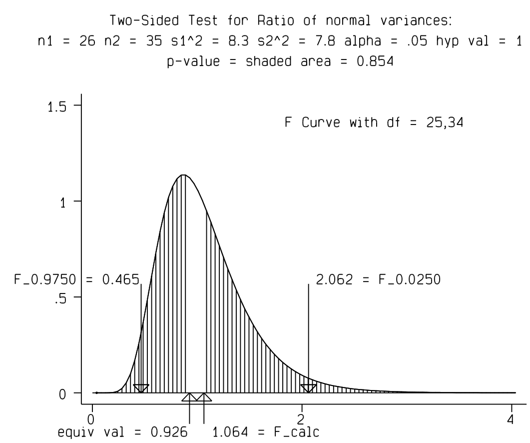
   A. If a population has a true proportion, $\pi =$ 50%, a sample proportion, $p = 41\%$, is more likely from a sample of size 50 than one of 100, so the p-value would be bigger and we would be less likely to reject.
   B. If a population has a true proportion, $\pi =$ 50%, a sample proportion, $p = 41\%$, is more likely from a sample of size 50 than one of 100, so the p-value would be bigger and we would be more likely to reject.
   C. If a population has a true proportion, $\pi =$ 50%, a sample proportion, $p = 41\%$, is less likely from a sample of size 50 than one of 100, so the p-value would be smaller and we would be less likely to reject.
   D. If a population has a true proportion, $\pi =$ 50%, a sample proportion, $p = 41\%$, is less likely from a sample of size 50 than one of 100, so the p-value would be smaller and we would be more likely to reject.
   E. You cannot not determine this without re-running the test.

19. Which of the following is an **IN**valid description of α, *which one's FALSE*?

   A. α is how often we are willing to make a Type I error.
   B. α is how often we mistake in hypothesis testing.
   C. α is the area of the hypothesized curve that gets rejected.
   D. The smaller α is the stronger evidence we need to prove the alternative.
   E. Two of the above are false, not just one.

20. Which of the following statements about confidence intervals is true? Assume that you've calculated 200 95% confidence intervals based on samples from the same population with mean $\mu = 50$ by the method we discussed.

   A. At least 190 of the intervals would contain 50.
   B. Exactly 190 of the intervals would contain 50.
   C. About 190 of the intervals would contain 50.
   D. The probability of any one of the intervals contains 50 is 0.95.
   E. Exactly two of the above are correct.



Bonus: The test above tests $H_0 : \sigma_1^2 = \sigma_2^2$ (the ratio is 1) or not, *i.e.*, whether the added assumption for Case 8 is valid or not. What is the correct conclusion?

   A. The p-value is large, so we fail to reject and conclude the assumption fails (is invalid).
   B. The p-value is large, so we fail to reject and conclude the assumption can't be proven invalid.
   C. The p-value is large, so we reject and conclude the assumption fails (is invalid).
   D. The p-value is large, so we reject and conclude the assumption can't be proven invalid.
   E. The ratio of the variances is 0.854 which is not 1, so the variances are not equal.

1C,2E,3E,4D,5D,6C,7B,8C,9D,10C,11B
12A,13C,14B,15A,16E,17E,18A,19B,20C,21B