

STAT303 Secs 506–508

Fall 1999

Exam #3

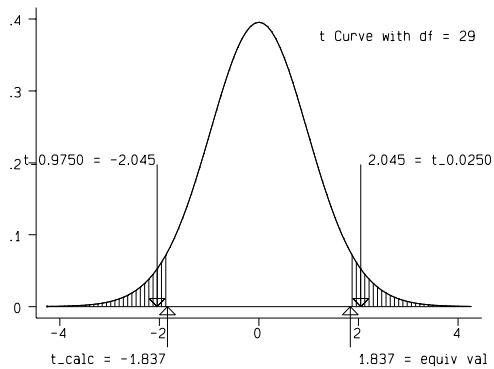
Instructor: Julie Hagen Carroll

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** on the scantron. Multiple marks will be counted wrong.
3. You will have 60 minutes to finish this exam.
4. 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.
5. This exam is worth 100 points, and will constitute 20% of your final grade.
6. Good luck!
7. Be sure to mark your section number, test form and PRINT the section and computer number for Thursday's class in the space beside where you sign your name. Also, PRINT your name at the top of this exam and include your Thursday section and computer number. You will get your scantron and exam back.

1. Which of the following is true?

- A. The t curve is always centered at zero.
- B. The z curve is used instead of the t curve to be more conservative.
- C. The t curve is used when we must estimate the mean.
- D. All of the above are true.
- E. Exactly two of the above are true.

Two-Sided Test for Difference of normal means, ind samples, vars equal:
 n's: 15,16 xbars: 14,16.4 var's: 3.2^2,4^2 alpha = .05 hyp val = 0
 p-value = shaded area = 0.077



2. What hypotheses are being tested in the graph above?

- A. $H_0 : \mu = 0$ vs. $H_A : \mu \neq 0$
- B. $H_0 : \mu_1 = 14$ vs. $H_A : \mu_2 = 16.4$
- C. $H_0 : \mu_1 = 0$ vs. $H_A : \mu_2 = 0$
- D. $H_0 : \mu_1 = \mu_2$ vs. $H_A : \mu_1 \neq \mu_2$
- E. $H_0 : \mu_1 - \mu_2 = 0.077$ vs. $H_A : \mu_1 - \mu_2 \neq 0.077$

90% |Lower Limit = 10.177573
 |Upper Limit = 11.822427

95% |Lower Limit = 10.020018
 |Upper Limit = 11.979982

99% |Lower Limit = 9.7120853
 |Upper Limit = 12.287915

3. Given the confidence intervals above, what is the correct range of the p -value for testing $H_0 : \mu = 10.2$ vs. $H_A : \mu \neq 10.2$?

- 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

4. What would happen to the confidence intervals in the previous problem if we had use a larger sample size?

- A. Each of the confidence intervals would be narrower.
- B. Each of the confidence intervals would be closer to the width of the z interval for the same level, assuming these are t intervals.
- C. Each of the confidence intervals would be more likely to include the hypothesized value, 10.2.
- D. All of the above are true.
- E. Exactly two of the above are true.

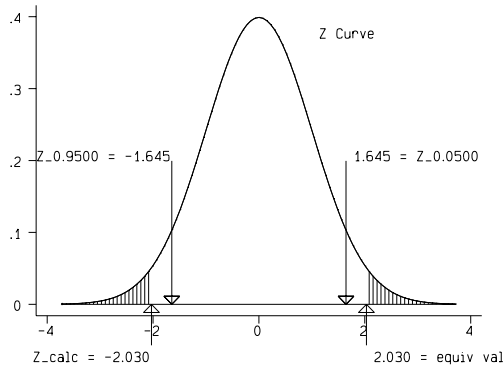
5. What would be the consequence of a Type II error for the test, $H_0 : \mu = 10.2$ vs. $H_A : \mu \neq 10.2$?

- A. We would fail to conclude that the true mean was 10.2 when is actually was 10.2.
- B. We would fail to conclude that the true mean was not 10.2 even though is actually was not 10.2.
- C. We would conclude that the true mean was 10.2 when is actually was 10.2.
- D. We would conclude that the true mean was not 10.2 when is actually was 10.2.
- E. We could fail to conclude that the true mean was 10.2 even though is actually was not 10.2.

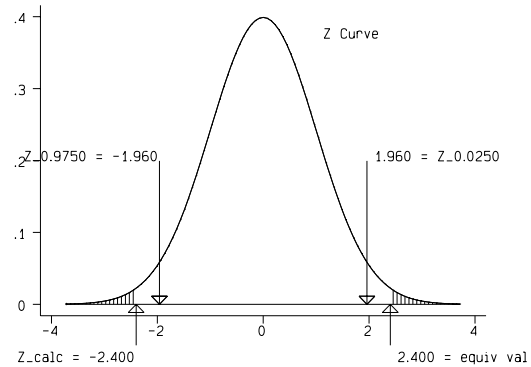
6. What is the advantage of using a paired t -test (Case 10) over either 2 sample t -tests (Cases 8 or 9)?

- A. You only need half as many observations (smaller sample size).
- B. You have more power (easier to detect a difference).
- C. You have more degrees of freedom (less conservative test).
- D. All of the above are advantages to the paired t -test.
- E. Exactly two of the above are advantages to the paired t -test.

Two-Sided Test for Difference of proportions p_1-p_2 :
 $n_1 = 63$ $n_2 = 82$ $p_1 = .42$ $p_2 = .59$ $\alpha = .1$ $\text{hyp val} = 0$
 p-value = shaded area = 0.042

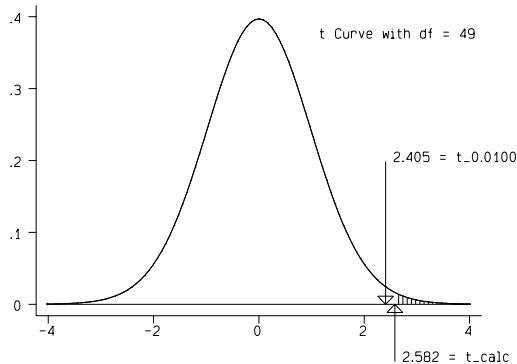


Two-Sided Test for 0-1 proportion p_i (approximate):
 $n = 36$ $p = .3$ $\alpha = .05$ $\text{hyp val} = .5$
 p-value = shaded area = 0.016



7. What is the best explanation of the p-value for the test above?
- 4.2% of the time we will get a true H_0 .
 - 4.2% of the time we will get 0.42 and 0.59 for the sample proportions.
 - 4.2% of the time we will get differences of 0 when the true proportions are 0.42 and 0.59.
 - 4.2% of the time we will get differences of 0.42 and 0.59 when the true proportions are 0.
 - 4.2% of the time we will get differences at least as large as $0.42 - 0.59$ when the true difference is 0.
8. Why would you prefer to run a one-sided tests of hypotheses instead of a two-sided?
- If you only cared about whether you were better (bigger or smaller, whichever would be appropriate), then the one-sided test would give you more power.
 - If you had a sample mean that was less than what you were testing against, you should run a left-sided test.
 - If you knew that the null hypothesis was true, you could still get a rejection with a one-sided test.
 - You will always get a rejection with a one-sided test if you rejected with a two-sided test.
 - The one-sided test requires less data to get a rejection.
9. If we have created 90, 95 and 99% confidence intervals using the data above, which intervals would have contained the hypothesized proportion, $\pi = 0.5$?
- all three
 - only the 90%
 - only the 99%
 - both the 90 and 95%
 - both the 95 and 99%
10. A 95% confidence interval for the true mean test score on this exam is (68.95, 81.05). Which of the following is true?
- The sample mean test score is 75.
 - You have a 95% chance of making between a 69 and 81.
 - 95% of the class will make between a 69 and an 81.
 - 95% of all the different classes will have an average between 68.95 and 81.05.
 - Exactly two of the above are true.
11. Suppose we run a hypothesis test at the 5% significance level. Which of the following is true?
- If we repeatedly sampled the data and ran the same test, we will reject about 5% of the time.
 - If we repeatedly sampled the data and ran the same test, we will fail to reject about 95% of the time.
 - If we repeatedly sampled the data and ran the same test, we will make a Type II error about 95% of the time.
 - If we repeatedly sampled the data and ran the same test, we will make a Type I error about 5% of the time.
 - Exactly two of the above are true.

Right-Sided Test for Mean of nonnormal, sigma unknown but n large:
 $n = 50$ $\bar{x} = 62$ $s^2 = 30$ $\alpha = .01$ $\text{hyp val} = 60$
 p-value = shaded area = 0.006



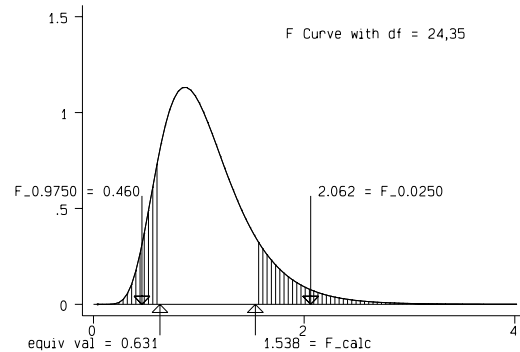
12. In the test above, what would have happened if we had gotten a sample mean, $\bar{x} = 60.5$, instead?

- A. We would have tested different hypotheses since we had different data.
- B. We would have used a different α -level since our data was closer to the hypothesized value, 60.
- C. We would have gotten a different p-value since we had different data.
- D. All of the above are true.
- E. Exactly two of the above are true.

13. Suppose you are interested in the caloric content of hamburgers. You took a random sample from 3 different chains and calculated the following confidence intervals: Chain 1: (248.9,307.8); Chain 2: (263.5,309.3); Chain 3: (307.1,349.7). Which of the following would be the most appropriate conclusion?

- A. The true mean caloric content for Chain 3 is more than that of Chain 1 or 2.
- B. The true mean caloric content for Chain 3 is more than that of Chain 1 but not Chain 2.
- C. The true mean caloric content is different for all three chains.
- D. The true mean caloric content is possibly the same for all three chains.
- E. We cannot determine any conclusion since we don't have a method for testing three means.

Two-Sided Test for Ratio of normal variances:
 $n_1 = 25$ $n_2 = 36$ $s_1^2 = 6.2^2$ $s_2^2 = 5^2$ $\alpha = .05$ $\text{hyp val} = 1$
 p-value = shaded area = 0.241



14. What is being tested in the graph above?

- A. $H_0 : \mu_1 = \mu_2$ vs. $H_A : \mu_1 \neq \mu_2$
- B. $H_0 : \sigma_1^2 = \sigma_2^2$ vs. $H_A : \sigma_1^2 \neq \sigma_2^2$
- C. $H_0 : \mu_1/\mu_2 = 1$ vs. $H_A : \mu_1/\mu_2 \neq 1$
- D. $H_0 : \mu_1 - \mu_2 = 1$ vs. $H_A : \mu_1 - \mu_2 \neq 1$
- E. $H_0 : \sigma_1^2 - \sigma_2^2 = 1$ vs. $H_A : \sigma_1^2 - \sigma_2^2 \neq 1$

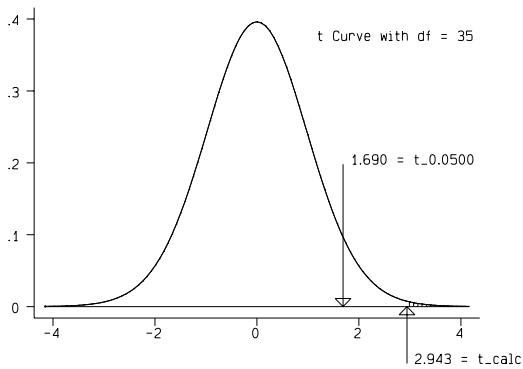
15. The paper "Undergraduate Marijuana Use and Anger" (*J. of Psychol.*(1988)) reported that a sample of 47 frequent marijuana users had a mean anger expression score of 42.72 with a standard deviation of 6.05. If we wanted to test whether frequent marijuana users have a higher mean anger expression score than the general public, which type of test should we do?

- A. Case 1 using the general public's mean anger expression score and standard deviation as the hypothesized value and σ , respectively.
- B. Case 2 using the general public's mean anger expression score as the hypothesized value and the standard deviation from our sample.
- C. Case 3 using the general public's mean anger expression score as the hypothesized value and our sample standard deviation as σ since our sample size is more than 30.
- D. Case 6 using the proportion of the general public with anger expression scores more than 42.72 as the hypothesized value.
- E. Case 9 and take a large sample from the general public and calculate a mean and standard deviation.

16. Which of the following is the best interpretation of the power of a test of hypotheses?
- A. The power of the test is the proportion of times you reject.
 - B. Under repeated sampling, the power of the test is the proportion of times you reject.
 - C. Under repeated sampling, the power of the test is the proportion of times you reject a false H_0 .
 - D. Under repeated sampling, the power of the test is the proportion of times you reject a true H_0 .
 - E. The power of the test measures how false H_0 is.

17. When should you use a significance level of 1% instead of 5%?
- A. when you want to keep the chance of making a Type I error low.
 - B. when you want to keep the chance of making a Type II error low.
 - C. when you want to keep the chance of making a Type II error high.
 - D. when you want to keep the power of the test high.
 - E. Exactly two of the above are good reasons.

Right-Sided Test for Mean of nonnormal, sigma unknown but n large:
 $n = 36$ $\bar{x} = 12.6$ $s^2 = 5.3^2$ $\alpha = .05$ $\text{hyp val} = 10$
 p-value = shaded area = 0.003

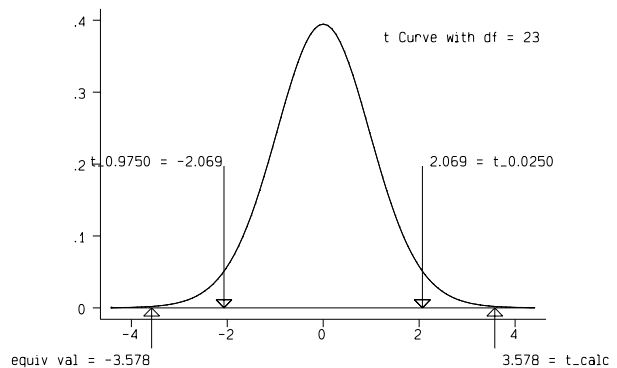


18. What would be the result of a Type I error in the test represented above?
- A. We would claim that the true mean was 12.6 when it really was only 10.
 - B. We would claim that the true mean was 10 when it really was 12.6.
 - C. We would claim that the true mean was more than 10 when it really was only 10.
 - D. We would claim that the true mean was more than 10 when it really was 12.6.

- E. We would claim that the true mean was not 10 when it really was 10.

19. The lifetime of 60W GE light bulbs are known to follow an exponential distribution. GE wants to test its own claim that the average lifetime of its 60W light bulbs is at least 1000 hours, so they test 10 bulbs at random (they don't want to destroy too many) and calculate the mean and standard deviation of their sample. Which type of test should they perform?
- A. Case 1 since they know the true standard deviation of the light bulb lifetimes.
 - B. Case 2 since they have a small sample.
 - C. A nonparametric test since they have a small sample.
 - D. Case 5 since the data is not normal.
 - E. Case 9 using the known mean and standard deviation as the second sample statistics.

Two-Sided Test for Mean of normal, sigma known:
 $n = 24$ $\bar{x} = 20$ $s^2 = 30$ $\alpha = .05$ $\text{hyp val} = 16$
 p-value = shaded area = 0.002



20. What conclusion can be made from the test above?
- A. The true mean is not 16.
 - B. The true mean is not 20.
 - C. The true mean is 20.
 - D. We have insufficient evidence to conclude that the true mean is 16.
 - E. We have insufficient evidence to conclude that the true mean is not 16.