STAT303: Secs 508 - 510
Spring 2005
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 mark your CORRECT section number and your test form on the scantron!
3. Sign your name where indicated on your scantron. You may keep this exam.
4. 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.
5. You will have **60 minutes** to finish this exam.
6. This exam is worth 100 points, and will constitute 20% of your final grade.
7. 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.
8. Good luck!

1. Why would you prefer to run a one-sided tests of hypotheses instead of a two-sided?
   A. 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.
   B. The one-sided test requires less data to get a rejection.
   C. If you knew that the null hypothesis was true, you could still get a rejection with a one-sided test.
   D. You will always get a rejection with a one-sided test if you rejected with a two-sided test.
   E. More than one of the above are true.

2. Which of the following is the best interpretation of the p-value = 0.001 when testing $H_0 : \mu = 50$ vs. $H_A : \mu < 50$? Note: $\bar{x} = 48$.
   A. 0.1% of the time we will reject the the null hypothesis.
   B. 0.1% of the time we will get a sample mean, $\bar{x} = 48$ or more, when the true mean, $\mu = 50$.
   C. 0.1% of the time we will get a sample mean, $\bar{x} = 50$ or more, when the true mean, $\mu = 48$.
   D. 0.1% of the time we will get a sample mean, $\bar{x} = 48$ or less, when the true mean, $\mu = 50$.
   E. 0.1% of the time we will get a sample mean, $\bar{x} = 50$ or less, when the true mean, $\mu = 48$.

3. Suppose the sample size used in the problem above was, $n = 25$. If we took a different random sample of size $n = 40$ and still got $\bar{x} = 48$, what would be the new p-value after running the same set of hypotheses?
   A. 0.001 since it's the same $\bar{x}$, hence the same distance between $\bar{x} = 48$ and $\mu_0 = 50$.
   B. 0 because it's impossible to get the exact same sample mean, $\bar{x} = 48$.
   C. something less than 0.001 since there would be less standard deviations between $\bar{x} = 48$ and $\mu_0 = 50$.
   D. something more than 0.001 since there would be more standard deviations between $\bar{x} = 48$ and $\mu_0 = 50$.
   E. something less than 0.001 since there would be more standard deviations between $\bar{x} = 48$ and $\mu_0 = 50$.

4. Suppose we ran a hypothesis test at the 5% significance level. Which of the following is true?
   A. If we repeatedly sampled the data and ran the same test, we would reject about 5% of the time.
   B. If we repeatedly sampled the data and ran the same test, we would fail to reject about 95% of the time.
   C. If we repeatedly sampled the data and ran the same test, we would make a Type II error about 95% of the time.
   D. If we repeatedly sampled the data and ran the same test, we would make a Type I error about 5% of the time.
   E. Exactly two of the above are true.

5. Suppose I want to test the statement "the mean age of patients at a hospital is more than 60 years". Which of the following sets of hypotheses should I use?
   A. $H_0 : \mu = 60$ vs. $H_A : \mu \neq 60$
   B. $H_0 : \pi = 60$ vs. $H_A : \pi > 60$, where π is the proportion of patients over 60.
   C. $H_0 : \pi = 0.5$ vs. $H_A : \pi > 0.5$, where π is the proportion of patients over 60.
   D. $H_0 : \pi = 0.5$ vs. $H_A : \pi \neq 0.5$, where π is the proportion of patients over 60.
   E. $H_0 : \mu = 60$ vs. $H_A : \mu > 60$

6. Suppose we tested $H_0 : \pi = 0.5$ vs. $H_A : \pi \neq 0.5$ and got a p-value = 0.016. If we created 90, 95 and 99% confidence intervals using the same sample data, which intervals would contain the hypothesized proportion, $\pi = 0.5$?
   A. all three
   B. only the 90%
   C. only the 99%
   D. both the 90 and 95%
   E. both the 95 and 99%

7. Which of the following best describes the assumptions for the Chi-squared test in a contingency table?

   A. Each sample size must be at least 30.
   B. The variances must be equal.
   C. The means must be equal.
   D. The proportions must be equal.
   E. Each count must be at least 5.

8. If I tested $H_0 : \mu_1 = \mu_2$ vs. $H_A : \mu_1 \neq \mu_2$, and got a p-value = 0.02, which of the following would be true?

   A. I would conclude the means are different at the 5 and 10% significance levels, but not at the 1%.
   B. A greater than test, $H_A : \mu_1 > \mu_2$, would have a p-value = 0.01 if we used the same data.
   C. I must have both sample sizes greater than 30 if I don't know the data is normal.
   D. All of the above are true.
   E. Exactly two of the above are true.

9. 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.

10. If we tested $H_0 : \pi = 0.5$ vs. $H_A : \pi \neq 0.5$ and got a p-value = 0.206, which of the following would true?

    A. We would conclude that the true proportion, π is not 0.206.
    B. Since 0.5 is not less than 0.206, we would say we have insufficient evidence to prove the true proportion is not 0.5.
    C. Since 0.206 is less than 0.5, we would claim the true proportion is not 0.5.
    D. We could have made a Type II error.
    E. None of the above would be true.

Race of Respondent * General Happiness

	General Happiness			
	Very Happy	Pretty Happy	Not Too Happy	Total
White	409	730	117	1256
Black	46	116	39	201
Other	12	26	9	47
Total	467	872	165	1504

	Value	df	Sig.
Chi-Square	24.797		0.000

11. What is the Expected Count for *Not Too Happy White(s)*?

    A. 117
    B. (117/165 * 117/1256)/1504
    C. (165 * 1256)/1504
    D. (165 * 1256)/117
    E. (165/1504 * 1256/1504)/117

12. What are the degrees of freedom for the χ^2 test in the previous problem?

    A. 9
    B. 4
    C. 3
    D. 2
    E. It's missing from the table, so we can't say.

13. Which of the following is the correct conclusion for the χ^2 test in the previous problem?

    A. Since the p-value is 0, we would conclude that one's race has an effect on one's happiness.
    B. Since the p-value is 0, we would conclude that most people are pretty happy.
    C. Since the p-value is 0, we would conclude that whites are more likely to be very happy than other races.
    D. Since the p-value is 0, we would conclude that not too many people admit that they aren't happy.
    E. None of the above are the correct conclusion.

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14. 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.

15. 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.

16. 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.

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      1=No| Summary of No. of finger
 caffeine;|    taps per minute
  2=100mg;|
   3=200mg|        Mean   Std. Dev.       Freq.
----------+-----------------------------------
        1 |       244.8    2.394438          10
        2 |       246.4   2.0655911          10
        3 |       248.3   2.2135944          10
----------+-----------------------------------
    Total |       246.5   2.5964166          30
                 Analysis of Variance
Source       SS      df      MS       F     Pr > F
----------------------------------------------------
Between     61.40     2    30.70    6.18   0.0062
Within     134.10    27     4.97
----------------------------------------------------
Total      195.50    29     6.74
```

17. What are the null and alternative hypotheses for the ANOVA test above?

    A. $H_0 : \mu_1 = \mu_2 = \mu_3$ vs. H_A: at least one mean is different
    B. $H_0 : \mu_1 = \mu_2 = \mu_3$ vs. $H_A : \mu_1 \neq \mu_2 \neq \mu_3$
    C. $H_0 : \mu_1 = \mu_2$ vs. $H_A : \mu_1 \neq \mu_2$
    D. $H_0 : \mu_1 = \mu_2$ vs. H_A: at least one mean is different
    E. $H_0 : \mu_1 = \mu_2 = \mu_3$ vs. H_A: the means are not all different

18. What conclusion may be made from the previous output?

    A. The variances are not all equal.
    B. Drinking coffee makes you jittery.
    C. The more caffeine you consume, the jitterier you get.
    D. There is a difference in the jitteriness, based on finger taps, due to caffeine.
    E. None of the above are correct.

19. Which of the following would be a Type I error for the previous ANOVA F-test?

    A. We concluded that the more caffeine you drink the more jittery you are when in fact it's the opposite. More caffeine makes you less jittery.
    B. We concluded that caffeine had a siginificant effect on one's jitteriness when it actually has little or no effect.
    C. We concluded that there was insufficient evidence to prove caffeine affected one's jitteriness when actually it does have an effect.
    D. We concluded that caffeine affects people differently when actually it affects everyone the same.
    E. None of the above are correct.

20. 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.

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