STAT303 Sec 507-510
Fall 2012
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 50 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 11:10 is 507, 12:45 is 508, 2:20 is 509, and 3:55 is 510) and FORM (A, B, C or D) and 21 answers, then turn in JUST your scantron.
7. Good luck!

1. If $X \sim N(14, 8^2)$, what is the distribution of $\overline{X}_{16}$, the average based on a sample size of 16?

   A. $\overline{X}_{16} \sim N(14, 0.5^2)$
   B. $\overline{X}_{16} \sim N(14, 2^2)$
   C. $\overline{X}_{16} \sim N(3.5, 2^2)$
   D. Since the sample size is less than 30, we can't say the shape is normal, but the mean, $\mu = 14$ and the standard deviation, $\sigma = 2$.
   E. Since the sample size is less than 30, we can't say the shape is normal, but the mean, $\mu = 14$ and the standard deviation, $\sigma = 0.5$.

2. Let μ be the mean tree height in feet in Yosemite national park. If we tested 20 trees, randomly selected and measured, using $H_0 : \mu = 20$ vs. $H_A : \mu > 20$ and got a p-value $= 0.23$, what the number 0.23 mean?

   A. It is the probability that the null hypothesis is true.
   B. 23% of our sample trees are taller than 20 feet.
   C. 23% of the time we will get a sample mean greater than 20 feet.
   D. It is how many standard deviations your statistic was from the claimed parameters value of 20.
   E. None of the above.

3. Using the three confidence intervals below, what is the correct range of the p-value when testing $H_0 : \mu = 30$ vs. $H_A : \mu \neq 30$?

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90% (24.246, 29.354)
95% (23.717, 29.883)
99% (22.617, 30.983)
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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. There's not a hypothesized value to determine the p-value.

4. In a recent random sample of 1,000 Americans, 40% reported that they have confidence that elections are conducted honestly, for a 95% confidence interval of (0.37, 0.43). How should we interpret this confidence interval?

   A. We are 95% confident that between 37% and 43% of the 1,000 study participants are confident that elections are conducted honestly.
   B. We are 95% confident that between 37% and 43% of all Americans are confident that elections are conducted honestly.
   C. 95% of Americans are between 37% and 43% confident that elections are conducted honestly.
   D. In repeated sampling, 95% of all confidence intervals conducted in this manner would contain the value 0.4.
   E. In repeated sampling, 95% of all confidence intervals conducted in this manner would contain the proportion of the 1,000 study participants that are confident that elections are conducted honestly.

5. Do Education majors take more hours than other majors?

college	n	Mean	Std. Dev.	Std. Err.
AGLS	22	13.64	2.19	0.47
BUSI	5	13.6	1.34	0.6
EDUC	81	14.90	1.75	0.19
LIBA	34	14.68	1.72	0.29
SCIE	12	13.75	1.29	0.37

ANOVA table

Source	df	SS	MS	F-Stat	P-value
Treatments	A	41.07	10.27	C	0.0135
Error		469.19	B		
Total		510.26			

   What are the missing values in the ANOVA table above?

   A. A = 4, B = 3.15, C = 3.26
   B. A = 5, B = 3.17, C = 3.24
   C. A = 4, B = 3.17, C = 3.24
   D. A = 5, B = 3.15, C = 3.26
   E. Too many values are missing to determine them all.

6. The output in the last question is from our class survey. What can we conclude?

   A. At the 5% level, we can conclude Education majors do take more hours on average.
   B. At the 5% level, we can conclude there is a difference in the average number of hours taken by major.
   C. At the 1% level, we can conclude there is no difference in the average number of hours taken by major.
   D. Although the test is significant at the 5% level, there is no real difference in the average hours taken by major.
   E. None of the above are correct.

7. Which of the following is the best interpretation of the previous p-value, 0.0135, assuming we sample from the same population?

   A. 1.35% of the time, we will get sample means at least this different even though the true means are the same.
   B. 1.35% of the time, we will get sample means like this even though the true means are different.
   C. 1.35% of the time, we will find the true means are different when the sample means are the same.
   D. 1.35% of the time, we will get true means at least this different even though the sample means are the same.
   E. 1.35% of the time, we will get data no different than this if the true means are the same.

8. The Central Limit Theorem allows us to

   A. know the shape of the population distribution.
   B. know that as n increases the sample becomes approximately normal in shape.
   C. we can use the normal table as long as our sample is large enough.
   D. calculate probabilities about $\bar{x}$ from a large random sample taken from a non-normal population.
   E. None of the above are true about the CLT.

9. We want to test $H_0 : \mu = 20$ with an $\alpha = 0.05$ and a two sided alternative. Unfortunately, the data was lost but we have a 95% confidence interval for μ. The interval was (0.5, 19.9). What decision should we make using this information?

   A. We cannot make a decision without a p-value.
   B. We should reject the null hypothesis since 20 is not within the interval.
   C. The results are inconclusive as the interval may or may not contain μ.
   D. We should fail to reject the null hypothesis, 19.9 is very close to 20.
   E. None of the above

10. A certain brand of jeans with waist 34" (34W) never seem to fit you properly. You have measured your waist and know that it is 33", so 34W pants should fit you loosely. They are always really tight, tight enough that you have to squeezed into them. You decide to test to see if the jeans are sized wrong. You sample 50 pairs of jeans and create a 99% confidence interval for the true mean waist size of (32.5, 33.75). What can you say about the hypothesis test?

    A. Reject at the $\alpha = 0.10$, fail to reject at the $\alpha = 0.05$ and 0.01 levels.
    B. Reject at the $\alpha = 0.10$ and 0.05 levels, fail to reject at the $\alpha = 0.01$.
    C. Reject at the $\alpha = 0.10$, 0.05 and 0.01 levels.
    D. The interval must be wrong since it doesn't contain 34".
    E. You cannot perform a hypothesis test with a confidence interval.

11. You take a simple random sample of 100 people, measure their height, and the resulting 95% confidence interval is (120, 140) in lbs. What is the correct interpretation of this 95% confidence interval?

    A. 95% of all heights in the sample are contained within the interval.
    B. 95% of the time the true mean of people's heights will be contained within the interval.
    C. We are 95% confident that this interval contains sample mean of people's heights.
    D. We are 95% confident that this interval captures the true average height.
    E. None of the above are correct.

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Summary statistics for wrist:
Group by: gender
gender   n   Mean Std.Dev. Std. Err.
female  51  6.256  0.795    0.111
male    31  7.363  1.969    0.354

Hypothesis test results:
mu1: mean of wrist where gender="male"
mu2: mean of wrist where gender="female"
H0: mu1 - mu2 = 0
HA: mu1 - mu2 > 0
(with pooled variances)
 Diff      Mean  Std. Err. DF  T-Stat P-value
mu1 - mu2  1.107  0.3097    80  3.575  0.0003
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12. We know that on average males are taller than females, but does that mean they have bigger hands, heads, etc.? The output above is comparing wrist sizes for our class. What conclusion can be made from this assuming our class is representative of young American adults?

    A. Yes, males have larger wrists. The p-value = 0.0003 is quite small.
    B. The p-value $= 0.0003 * 2$, but still small enough to claim males have larger wrists.
    C. Yes, the p-value is small, but the difference is just 1.1 inches which isn't enough to be practically important.
    D. The sample sizes aren't the same, so the test is invalid.
    E. The standard deviations are too different to do a pooled t-test.

13. Had we run a 2-sample t-test using the previous data. Using the conservative degrees of freedom, what would be the correct range of the p-value?

    A. $0.0005 > p$-value
    B. $0.001 > p$-value > 0.0005
    C. $0.002 > p$-value > 0.001
    D. $0.0025 > p$-value > 0.001
    E. The test statistic value would be different, so all we can say is it would be larger than 0.0003.

14. Which of following would be considered a Type II error in the previous question(s)?

    A. claiming that males have larger wrists when in reality they aren't larger
    B. claiming that males' wrists are the same size as females when they're actually larger
    C. failing to prove males' wrists are larger than females when they're actually larger
    D. failing to prove males' wrists are the same size as females when they're actually larger
    E. failing to prove males' wrists are the same size as females when they're actually larger

15. If $X \sim N(14, 8^2)$, how likely are you to get a *sample mean from a sample of 16* of at least 20?

   A. 0.0013
   B. 0.2266
   C. between 0.005 and 0.0025
   D. between 0.01 and 0.005
   E. 0.7734

16. Which of the following is true?

   A. The larger the sample size, n, the less variable the sample means, $\overline{x}$'s.
   B. The sample means will have the same mean as the population, $\mu_{\overline{x}} = \mu_x$, if we take random samples.
   C. Unbiasedness means the sample is random.
   D. All of the above are true.
   E. Exactly two of the above are true.

17. Suppose you're testing $H_0 : \mu = 5$ vs. $H_A : \mu > 5$ and you get a p-value = 0.036. Which of the following is/are correct?

   A. 5 is NOT less than 3.6, so we fail to reject.
   B. The true mean is significantly greater than 5 at the 5% level.
   C. We can't say the true mean is significantly greater than 5 at the 5% level.
   D. We can't say the true mean is significantly greater than 5 at the 10% level.
   E. Two of the above are correct.

18. Which of the following best explains what the previous p-value is telling us?

   A. There is only a 3.6% chance that the null hypothesis is true.
   B. 3.6% of the time the null hypothesis will be true for this population.
   C. We will see a sample mean at least this large 3.6% of the time if the true mean is 5.
   D. We will see a sample mean 3.6% larger than the true mean of 5.
   E. We will see a sample mean larger than the true mean of 5, 3.6% of the time.

19. Researchers are interested in whether the proportion of people who check their email daily has risen over last year's proportion of 0.72. That is, they want to test $H_0 : p = 0.72$ vs. $H_A : p > 0.72$. Which of the following would be the best interpretation of the significance level α?

   A. If in reality the proportion of people who check their email this year is 0.72, in approximately 5% of samples researchers will find a p-value less than 0.05.
   B. If in reality the proportion of people who check their email this year is 0.72, in approximately 5% of samples researchers will find a sample proportion greater than 0.72.
   C. If in reality the proportion of people who check their email this year is greater than 0.72, in approximately 5% of samples researchers will find a sample proportion equal to 0.72.
   D. If in reality the proportion of people who check their email this year is greater than 0.72, in approximately 5% of samples researchers will find a p-value less than 0.05.
   E. If in reality the proportion of people who check their email this year is greater than 0.72, in approximately 5% of samples researchers will find a p-value greater than 0.05

20. A hypothesis test has a p-value = 0.007. What is the correct conclusion to make based on this p-value?

   A. The data are consistent with the null hypothesis; therefore, we do not reject the null hypothesis.
   B. The data are consistent with the null hypothesis; therefore, we reject the null hypothesis.
   C. The data are not consistent with the null hypothesis; therefore, we fail to reject the null hypothesis.
   D. The data are not consistent with the null hypothesis; therefore, we reject the null hypothesis.
   E. There is only a 0.7% chance that the null hypothesis is true; therefore, we reject the null hypothesis.

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