

STAT303 Sec 508-510

Spring 2009

Exam #2

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 we are trying to test $H_0 : \mu = 3$ vs. $H_A : \mu \neq 3$, where μ is the average number of children a woman thinks a family should have. If we get a 95% confidence interval of (3.3,4.1). What conclusion is appropriate?
- There is significant evidence that the average number of children a woman thinks a family should have is 3.
 - There is not significant evidence that the average number of children a woman thinks a family should have is 3.
 - There is significant evidence that the average number of children a woman thinks a family should have is not 3.
 - There is not significant evidence that the average number of children a woman thinks a family should have is not 3.
 - None of the above.
2. Which of the following is/are true statements?
- A probability is to a population what a sample proportion is to a sample.
 - A probability can help us decide whether to believe a claim about a population (some value for a parameter) or not.
 - We can use the normal distribution to find the probability of any event as long as our sample is large enough.
 - All of the above are true.
 - Only two of the above are true.
3. Using the three confidence intervals below, what is the correct range of the p -value when testing $H_0 : \mu = 23$ vs. $H_A : \mu \neq 23$?
- 90% (23.139, 26.861)
 95% (22.783, 27.127)
 99% (22.086, 27.914)
- p -value > 0.10
 - $0.10 > p$ -value > 0.05
 - $0.05 > p$ -value > 0.01
 - p -value < 0.01
 - You need a test statistic value to determine the p -value
4. What are the missing probability and the mean for the distribution below?
- | | | | | | | | | | | | |
|------|--|-----|--|-----|--|------|--|-----|--|-----|--|
| X | | 0 | | 1 | | 2 | | 3 | | 4 | |
| | | | | | | | | | | | |
| p(X) | | 0.4 | | 0.3 | | 0.15 | | 0.1 | | ??? | |
- Without the probability, we cannot determine the mean.
 - $p(4) = 0.5$ and $\mu = 1.4$
 - $p(4) = 0.5$ and $\mu = 2.9$
 - $p(4) = 0.05$ and $\mu = 1.1$
 - $p(4) = 0.05$ and $\mu = 1.5$
5. Using the discrete distribution above, how likely are we to get all 1's if we draw three times, assuming each draw is independent?
- 0.9
 - 0.027
 - 0.3
 - 0.0003
 - 0.0001
6. Again using the discrete distribution, how likely are we to get no more than a 2?
- 0.15
 - 0.85
 - 0.70
 - 0.60
 - 0.55

7. We want to test $H_0 : \mu = 60$ vs. $H_A : \mu > 60$. We get a sample of 50 and find the mean to be 55.3. From a previous study we know that the standard deviation is 12.8, what are the value of the test statistic and the resulting p -value?
- $z = 2.60$ and the p -value = 0.9953
 - $z = -2.60$ and the p -value = 0.9953
 - $z = 2.60$ and the p -value = 0.0047
 - $z = -2.60$ and the p -value = 0.0047
 - $z = 2.60$ and the p -value = 0.0094
8. Suppose we want to test $H_0 : \mu \leq 60$ vs. $H_A : \mu > 60$ and the resulting p -value is 0.089. Which of the following is the correct conclusion?
- We would reject at the 10% level and conclude that the true mean is more than 60.
 - We would fail to reject at the 5 and 1% level and conclude that the true mean is not more than 60.
 - We would fail to reject at the 5 and 1% levels and conclude that the true mean is no more than (less than) 60.
 - A and B are correct conclusions.
 - A and C are correct conclusions.
9. Which of the following would be a Type I error for the test above?
- The true mean is 50 and we conclude that it is more than 60.
 - The true mean is 70 and we conclude that it is more than 60.
 - The true mean is 70 and we fail to prove it is more than 60.
 - The true mean is 50 and we fail to prove it is more than 60.
 - The true mean is 70 and we fail to prove it is less than 60.
10. Suppose the we are sampling family income data (skewed to the right data). If the true mean is \$500 per week with standard deviation \$20 per week, what is the distribution of the average of 50 families weekly income?
- $\bar{X}_{50} \sim N(500, (20/50)^2)$
 - $\bar{X}_{50} \sim N(500, (400/50)^2)$
 - $\bar{X}_{50} \sim N(500, \sqrt{400/50^2})$
 - The mean would be 500 and the standard deviation 8, but it wouldn't be normal since the data is skewed.
 - The mean would be 500 and the variance 8, but it wouldn't be normal since the data is skewed.
11. If $X \sim N(25, 14^2)$, how likely are we to get a sample mean from a sample of 25 that's less than 20?
- 0.0179
 - 0.9633
 - 0.9821
 - 0.0367
 - 0.3594
12. Suppose a test of $H_0 : \mu = 0$ vs. $H_A : \mu \neq 0$ is run with $\alpha = 0.05$. The p -value of the test is 0.069. If you were to calculate a 95% confidence interval for μ , would the resulting interval contain 0?
- No, because based on the p -value for the hypothesis test we would FTR the null, which means that 0 is not a plausible value for μ .
 - No, because based on the p -value for the hypothesis test we would reject the null, which means that 0 is not a plausible value for μ .
 - Yes, because based on the p -value for the hypothesis test we would FTR the null, which means that 0 is a plausible value for μ .
 - Yes, because based on the p -value for the hypothesis test we would reject the null, which means that 0 is a plausible value for μ .
 - There is not enough information to answer this question.

13. As the number of observations increases (the sample size increases),
- the sample statistic (\bar{x}) gets closer to the true parameter (μ).
 - the distribution of the sample statistic looks more normal.
 - the sample statistic becomes less biased.
 - All of the above are true.
 - Only two of the three statements are true.
14. Suppose we want to PROVE that girls are as good at math as boys. Which set of hypotheses should we use if μ_{girls} is the true mean math score for girls and μ_{boys} is the true mean math score for boys
- $H_0 : \mu_{girls} \neq \mu_{boys}$ vs. $H_A : \mu_{girls} = \mu_{boys}$ and reject H_0
 - $H_0 : \mu_{girls} = \mu_{boys}$ vs. $H_A : \mu_{girls} \neq \mu_{boys}$ and fail to reject H_0
 - $H_0 : \mu_{girls} = \mu_{boys}$ vs. $H_A : \mu_{girls} < \mu_{boys}$ and fail to reject H_0
 - Either B or C since that would mean boys aren't better at math.
 - We can't ever prove 'equal to', H_0 , so we can't do this.
15. What are the z critical values, the $z_{\alpha/2}$, for a 22% confidence interval?
- ± 0.77
 - ± 2.85
 - ± 0.39
 - ± 0.65
 - ± 0.28
16. Let $p_{42} \sim N(0.7, 0.071^2)$. How large of a sample proportion, p_{42} , would we need to have to be in the TOP 15th percentile?
- $0.7 + 0.15 * 0.071 = 0.71065$
 - $0.7 + 0.15 * 0.7 = 0.805$
 - $0.7 * 0.85 = 0.595$
 - $0.7 + 1.04 * 0.071 = 0.77384$
 - $0.7 + (-1.04) * 0.071 = 0.62616$
17. What is $P(-2.98 < Z < -1.56)$?
- 0.0608
 - 0.9392
 - 0.0580
 - 0.9420
 - You can't get a negative probability, so this isn't possible.
18. Why do we use the sample mean, \bar{x} , to estimate the population mean, μ , rather than the sample median, \tilde{x} ?
- because it makes sense to use a mean to estimate a mean
 - because the sample mean is unbiased
 - Both \bar{x} and \tilde{x} are unbiased so it doesn't matter which one we use.
 - because \bar{x} almost always has a smaller variance than \tilde{x}
 - It doesn't matter since \bar{x} and \tilde{x} are the same value for normal data.
19. A study of 5,392 people analyzed the relationship between gender and IQ. The subjects of the study were administered an IQ test and scored according to the Wechsler Adult Intelligence Scale. The average IQ for the men in the study was 103, while the average IQ for the women in the study was 101. The p -value for the study was 0.003. Which of the following is true?
- The study has statistical but not practical significance.
 - The study has practical but not statistical significance.
 - The study has both practical and statistical significance.
 - The study has neither practical nor statistical significance.
 - There is not enough information to determine the significance of the study.
20. Suppose a 95% confidence interval for μ is (4.68, 10.92). Which of the following statements is true?
- We are 95% confident that the true mean is 7.8, the center.
 - The true mean will be between 4.68 and 10.92 95% of the time.
 - We are confident that the true mean will be between 4.68 and 10.92 95% of the time.
 - The probability of getting a mean between 4.68 and 10.92 is 95%.
 - None of the above are correct statements about the confidence interval.

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