STAT303: Secs 509
Fall 2006
Exam #2
Form A

Instructor: Julie Hagen Carroll

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 15% 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 AND NOT discuss this exam with anyone until AFTER the grades are posted.
8. Good luck!

1. For $Z \sim N(0, 1^2)$ what is $P(-1.83 < Z < 1.66)$?

   A. 0.9851
   B. 0.9179
   C. 0.0149
   D. 0.0821
   E. 0.5675

or1. For $Z \sim N(0, 1^2)$ what is $P(-1.03 < Z < 2.66)$?

   A. 0.1476
   B. 0.8524
   C. 0.1554
   D. 0.8993
   E. 0.8446

2. Not that we would want one, but what would be the $\pm z_{\alpha/2}$'s for a 42% confidence interval, *i.e.*, $P(-z^* < Z < z^*) = 0.42$ where $Z \sim N(0, 1^2)$?

   A. ± 0.6628
   B. ± 0.20
   C. ± 0.55
   D. ± 0.6141
   E. ± 0.719

or2. Not that we would want one, but what would be the $\pm z_{\alpha/2}$'s for a 32% confidence interval, *i.e.*, $P(-z^* < Z < z^*) = 0.32$ where $Z \sim N(0, 1^2)$?

   A. ± 0.47
   B. ± 0.6255
   C. ± 0.6331
   D. ± 0.41
   E. ± 0.7517

3. If we think of the null hypothesis as there is **no fire** and a fire alarm going off as **claiming there IS a fire**, what would a false alarm correspond to?

   A. a correct decision since the fire department must respond to every alarm
   B. a Type I error because we rejected H_0
   C. a Type II error because we rejected H_0
   D. a Type I error because we failed to reject H_0
   E. a Type II error because we failed to reject H_0

4. Which of the following statements is/are true?

   A. Mutually exclusive events are always independent since can't both happen.
   B. Independent events have a probability of 0.
   C. Whether X and Y are independent, has no effect on μ_{X-Y}.
   D. Whether X and Y are independent, has no effect on σ_{X-Y}.
   E. None of the above are true statements.

5. Let $X \sim N(18, 6^2)$. What is $P(17 < \overline{X}_4 < 20)$, where $\overline{X}_4$ is the sample mean based on a sample of size 4?

   A. 0.3779
   B. 0.1193
   C. 0.1968
   D. 0.0618
   E. 0.8032

or5. Let $X \sim N(16, 6^2)$. What is $P(17 < \overline{X}_4 < 20)$, where $\overline{X}_4$ is the sample mean based on a sample of size 4?

   A. 0.2789
   B. 0.5375
   C. 0.1811
   D. 0.3161
   E. 0.4625

6. The FDA is in charge of making sure the drugs on the market are not harmful. With this in mind which set of hypotheses should they test?

   A. H_0 : the drugs are harmful vs. H_A : the drugs are not harmful
   B. H_0 : the drugs are not harmful vs. H_A : the drugs are harmful
   C. H_0 : the drugs are helpful vs. H_A : the drugs are not helpful
   D. H_0 : the drugs are not helpful vs. H_A : the drugs are helpful
   E. H_0 : the drugs are not harmful vs. H_A : the drugs are not helpful

7. Which of the following would increase the power of a hypothesis test, $H_0 : \mu = 5$ vs. $H_A : \mu > 5$, when the true mean of the data is 8?

   A. testing $H_0 : \mu = 6$ vs. $H_A : \mu > 6$
   B. testing $H_0 : \mu = 4$ vs. $H_A : \mu > 4$
   C. using a smaller α-level
   D. using a smaller sample size, n
   E. All of the above would decrease the power.

8. A 90% confidence interval for the mean is 100 ± 4. Which of the following statements is TRUE?

   A. There is a 90% probability that the true mean is 100 and the true margin of error is 4.
   B. There is a 90% probability that μ is between 96 and 104.
   C. If we took many additional random samples of the same size and from each computed a 90% confidence interval for μ, approximately 90% of these intervals would contain μ.
   D. If we took many additional random samples of the same size and from each computed a 90% confidence interval for μ, approximately 90% of the time μ would fall between 96 and 104.
   E. There is 10% probability that the true mean is not between 96 and 104.

9. Suppose the grades on an exam are $X \sim N(55, 10^2)$. I want to raise the mean by 20 points plus reduce the standard deviation by 5, so I convert the grades using $Y = X/5 + 20$. What is the new distribution of the grades? Note: this is just a shift and scale change, but it may not give me the distribution I wanted.

   A. $Y \sim N(75, 5^2)$
   B. $Y \sim N(75, 2^2)$
   C. $Y \sim N(15, 5^2)$
   D. $Y \sim N(31, 2^2)$
   E. $Y \sim N(31, 22^2)$

10. What do we mean when we talk about the sampling distribution of $\overline{X}_n$ for estimating μ?

   A. The distribution of the different values of the sample mean for all samples of any size.
   B. The distribution of the different values of the population mean.
   C. The distribution of the samples themselves, where we look at samples of the same size.
   D. The distribution of the samples themselves, where we look at all samples of any size.
   E. The distribution of the different values of the sample mean for all samples of the same size.

11. Suppose we want to test $H_0 : \mu = 21$ vs. $H_A : \mu \neq 21$, but all we have is a 95% confidence interval for $\mu =$ (13.492, 22.508). Which of the following would be true?

   A. We would reject H_0 at the 10% level of significance.
   B. We would reject H_0 at the 5% level of significance.
   C. We would fail to reject H_0 at the 1% level of significance.
   D. Two of the above are true.
   E. None of the above are true.

12. Let's say the true proportion of pink Mike and Ike's® is $\pi = 0.25$ in bags of 50 pieces. What should be the distribution of the sample proportion, p (% per bag)?

   A. $p \sim N(0.25, 0.00375^2)$
   B. $p \sim N(0.25, 3.062^2)$
   C. $p \sim N(0.25, 0.0612^2)$
   D. $p \sim N(12.5, 3.062^2)$
   E. We can't say the distribution of normal, but the mean, $\mu_p = 25\%$

13. Given the distribution of the proportion of pink Mike and Ike's® in bags of 100 is $p_{100} \sim N(0.2, 0.04^2)$, how likely am I to get at least 30% pink ones?

   A. never, 0%
   B. 4% of the time
   C. 10% of the time
   D. 6.2% of the time
   E. 0.62% of the time

or13. Given the distribution of the proportion of pink Mike and Ike's® in bags of 100 is $p_{100} \sim N(0.2, 0.04^2)$, how likely am I to get at least 25% pink ones?

   A. never, 0%
   B. all of the time
   C. 25% of the time
   D. 89.24% of the time
   E. 10.56% of the time

14. Which of the following is/are true?

   A. If you reject H_0, you can never make a Type II error.
   B. If you reject H_0 at the 5% level, you would also reject at the 1% level.
   C. If you claim $H_A : \mu \neq \mu_0$ at the 5% level, then μ_0 would be in a 90% confidence interval using the same data.
   D. All of the above are true statements.
   E. Only two of the above are true.

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  X  |   0   |   1   |   2   |   3   |
--------------------------------------
p(X) |  0.5  |  0.2  |  0.2  |  0.1  |
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15. What are the mean and median of X in the distribution above?

    A. $\mu = 0$ and $\tilde{X} = 0$
    B. $\mu = 0.5$ and $\tilde{X} = 0.5$
    C. $\mu = 0.9$ and $\tilde{X} = 0$
    D. $\mu = 0.9$ and $\tilde{X} = 0.5$
    E. $\mu = 0.9$ and $\tilde{X} = 0.9$

16. What is $P(1 \leq X < 4)$ **for the same distribution**, the one above?

    A. 0.5
    B. 0.4
    C. 0.3
    D. 0.2
    E. 0.1

or16. What is $P(1 \leq X < 3)$ **for the same distribution**, the one above?

    A. 0.1
    B. 0.2
    C. 0.3
    D. 0.4
    E. 0.5

17. How likely are we to get three 3's **still** from the distribution above?

    A. 0, the probability that X exactly equals any number is always 0.
    B. $0.1 + 0.1 + 0.1$
    C. 0.1
    D. 0.1^3
    E. 0.03

18. Let $X \sim N(60, 8^2)$. What is the probability that we get an X that is more than 2 standard deviations above OR (2 standard deviations) below its mean?

    A. 0.9544
    B. 0.0228
    C. 0.0456
    D. 0.6826
    E. 0.3174

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90%: (22.4165, 29.9835)
95%: (21.692, 30.708)
99%: (20.2752, 32.1248)
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19. What is the correct range of the $p - value$ for testing $H_0 : \mu = 30$(or 20) vs. $H_A : \mu \neq 30$(or 20) given the three confidence intervals for μ above?

    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. You need a test statistic value to determine the p-value

20. Ferrari, a leading manufacture of Formula One race cars, claims that the average acceleration time to go from zero to 100mph is less than 2.3 seconds. To validate this claim, NASCAR conducted a series of tests and reported the test statistic as -2.81. The p-value for this test is

    A. 0.005
    B. 0.0025
    C. 0.3897
    D. 0.995
    E. 0.0107

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