STAT303 Sec 508-510
Spring 2010
Exam #1
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. Looking at the standard normal distribution, what is the proportion of values between \( z = -1.56 \) and \( z = -2.05 \)?

A. 0.9204
B. 0.0392
C. 0.0796
D. 0.0594
E. 0.0202

2. Which of the following is/are true?

A. An unbiased estimator has the same shape as the original (parent) population.
B. Increasing the sample size, increases the chance of having an unbiased estimator.
C. An unbiased estimator has the same spread as the original (parent) population.
D. All of the above are true.
E. None of the above are true.

3. Which of the following is true about the boxplots above? Label the topmost 1, then down to 5. Each distribution has 50 observations.

A. The distributions for 3 and 4 are the same.
B. Since 3 and 4 don’t have outliers, they are uniformly distributed.
C. 2 has a smaller standard deviation than 3 and 4.
D. Two of the above are true.
E. None of the above are true.

4. What is the 5 Number Summary for the histogram and which boxplot does it match?

A. 0, 1, 2, 3, 6; boxplot 3 or 4
B. 0, 2, 3, 3, 6; none of the boxplots
C. 0, 1, 2, 3, 7; boxplot 1
D. 0, 2, 2.5, 3, 6; boxplot 2
E. 1, 2, 2.5, 3, 4; boxplot 2

5. If \( X \sim N(15, 4^2) \), what is \( P(X > 20) \)?

A. 0.1056
B. 0.8944
C. 0.9938
D. 0.0062
E. 0.0202

6. What do we mean when we talk about the sampling distribution of \( \bar{X}_n \) for estimating \( \mu \)?

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.

7. 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. \( Y \sim N(31, 22^2) \)

8. Which of the following would be true if we multiply each data point in a distribution by 3?

A. The z-scores would not change.
B. The standard deviation would change but not the IQR.
C. The mean would change but not the median.
D. All of the above are true.
E. Two of the above are true.

9. Let \( \bar{X}_4 \sim N(13, 5^2) \), sample means based on samples of size 4. What is \( P(7 < \bar{X}_4 < 20) \)?

A. 0.0343
B. 0.9892
C. 0.8041
D. 0.5793
E. 0.0056
10. Jack and Jill are in different sections of 303. Jack made a 82 on the first test and his class average was a 75 with a standard deviation of 6. Jill made an 80 and her class average was a 72 with a standard deviation of 8. Who has the better class standing?

A. Jack since he has a higher score.
B. Jill since she is 8 points over the mean and Jack is only 7 points over.
C. Their standing is the same since they both made above the mean.
D. Jack
E. We can’t compare since we don’t know if the distributions are normal.

11. I hope the distribution of the exam scores is skewed left because

A. that would mean the average was high, in the upper half, not centered.
B. that would mean more than half the class had positive z-scores.
C. that would mean more than half the class passed.
D. Two of the above are good reasons.
E. None are correct. I should want the distribution to be normal.

12. If \( X \sim N(5,8^2) \) and \( Y \sim N(9,16^2) \), what is the distribution of \( X - Y \)? NOTE: I rounded to the nearest whole number.

A. \( N(14,8^2) \)
B. \( N(14,18^2) \)
C. \( N(-4,-8^2) \)
D. \( N(-4,8^2) \)
E. \( N(-4,18^2) \)

13. Which of the following indicate that the data must be at least approximately normally distributed?

A. The mean is approximately equal to the median.
B. The normal quantile plot shows the data points following the line on the plot.
C. The boxplot is symmetric.
D. All of the above indicate that the data is normally distributed.
E. Exactly two of the above indicate that the data is normally distributed (excluding D.).

14. If \( X \) is a continuous random variable, like a normal, then \( P(a < X < b) = ? \)

A. \( 1 - P(X \leq a) - P(X < b) \)
B. \( 1 - P(X \geq a) - P(X > b) \)
C. \( P(X < b) + P(X > a) \)
D. \( P(X > b) - P(X < a) \)
E. None of the above are correct.

15. Suppose we have a distribution, \( X \), with mean, \( \mu = 25 \), and standard deviation, \( \sigma = 9 \). The sampling distribution of the sample mean from a sample of size 16, \( \bar{X}_{16} \), would

A. be \( N(\mu = 25, (\sigma = 3/4)^2) \)
B. be \( N(\mu = 25, (\sigma = 9/4)^2) \)
C. be \( N(\mu = 25, (\sigma = 9/16)^2) \)
D. have \( \mu = 25, (\sigma = 3/4)^2 \) but unknown shape
E. have \( (\mu = 25, (\sigma = 9/4)^2 \) but unknown shape

16. Say we have a random sample. If we took another one of the same size from the same population, the new one

A. could have the same values as the first one.
B. could have completely different values than the first one.
C. would have the same distribution for the sample mean.
D. All of the above are true.
E. Only two of the above are true.

17. If \( X \) is distributed normally with a mean of 4 and a standard deviation of 3, find \( x \) so that the proportion of values greater than \( x \) is 0.20.

A. 1.48
B. -0.84
C. 0.84
D. 7
E. 6.52

18. If the five number summary for a distribution is \((-18.72, -16.06, -13.98, -11.08, 18.95)\), outside of what two numbers will the outliers fall?

A. \(-18.72 \) and \( 18.95 \)
B. \(-16.06 \) and \(-11.08 \)
C. \(-23.53 \) and \(-3.61 \)
D. \(-8.59 \) and \(-18.55 \)
E. \(-6.10 \) and \(-21.04 \)

19. Which of the following is true?

A. Every statistic has a sampling distribution.
B. Every statistic’s distribution can be approximated by the normal distribution.
C. Every statistic is unbiased.
D. All of the above are true.
E. Exactly two of the above are true.

20. What are the \( z \)-scores that have 87% of the distribution centered between them, i.e., what is \( \pm z \) for the middle 87%?

A. \( \pm 0.526 \)
B. \( \pm 0.55 \)
C. \( \pm 1.13 \)
D. \( \pm 1.51 \)
E. \( \pm 0.8078 \)

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