

Stat 2300 International, Fall 2006– Sample Midterm

Friday, October 20, 2006

Your Name: _____

A Number: _____

The Midterm consists of 35 questions: 20 multiple-choice questions (with exactly 1 correct answer) and 15 text-based questions where you have to provide a verbal explanation or calculate one or multiple numerical values. Some of the questions require you to use Excel. For other question, you can decide yourself whether you want to use Excel, a calculator, or do the calculations by hand.

The exam is worth a total of **350 points**. The number of points for each question is indicated in parentheses at the beginning of each question. You have approximately **90 minutes** to complete the exam. Try to correctly answer as many questions as possible during this time period. **You are allowed to answer questions in any order.** Start with a question that seems the easiest for you. If you cannot answer a question within a short time, move to another question, and come back to the previously unanswered questions toward the end of the exam.

Mark your answers to the multiple choice questions and fill in the spaces for the text-based questions on the **answer sheets**. Do not write your answers on the pages with the questions. However, you can use those pages for personal comments and calculations. Make sure to write your name and your A number on the pages with the questions **and** on the answer sheets. You have to turn in the pages with the questions **and** the answer sheets.

For multiple choice questions, mark exactly one of the choices (representing options a, b, c, or d) with a solid dot. Only 1 answer is correct. If you mark more than 1 of the options, this will automatically be an incorrect answer (even if one of the options you have marked is correct). For the text-based questions, indicate the formula you are using, the numerical values you have to fill in, and the final result (e.g., $n * p = 10 * 0.2 = 2$). Just the (correct) final result will not provide you with the full points for this question. If you use Excel to calculate a result, indicate which feature you have used (e.g., Summary Statistics) and the result from within Excel. Please do not write outside the text boxes.

In case of any problems with Excel, please inform your local instructor as quickly as possible and try to answer the questions as far as possible. Return to these questions later on. In case Excel is unavailable for an extended time period, your exam score will be adjusted accordingly.

1. (8 Points) Any characteristic of a population unit is called a
 - a. measurement.
 - b. sample.
 - c. observation.
 - d. variable.

2. (8 Points) When we are choosing a random sample and we do not place chosen units back into the population, we are
 - a. sampling with replacement.
 - b. sampling without replacement.
 - c. using a Systematic Sample.
 - d. using a Voluntary Response Sample.

3. (8 Points) _____ is the science of using a sample to make generalizations about the important aspects of a population.
 - a. Statistical Process Control
 - b. Descriptive Statistics
 - c. Random sample
 - d. Statistical Inference

4. (8 Points) Stem-and-leaf displays and dot plots are useful for detecting _____.
 - a. Outliers
 - b. Skewness
 - c. Midpoint of data
 - d. All of the above

5. (8 Points) A normal population has 99.73 percent of the population measurements within _____ standard deviations of the mean.
 - a. one
 - b. two
 - c. three
 - d. four

6. (8 Points) The standardized value of any value in a population or sample is called
 - a. percentile
 - b. coefficient of variation
 - c. quartile
 - d. Z-score

7. (8 Points) If the probability of event A occurring is not dependent on event B occurring we have:

- a. Independent events
- b. Mutually exclusive events
- c. Conditional events
- d. Dependent events

8. (8 Points) Events that have no sample space outcomes in common, and, therefore, cannot occur simultaneously are

- a. independent.
- b. mutually exclusive.
- c. intersections.
- d. unions.

9. (8 Points) When two events are independent and we are calculating conditional probability $P(A | B)$ then it follows that

- a. $P(A) = P(B)$
- b. $P(A | B) = P(A)$
- c. $P(A \cap B) = 0$
- d. $P(A \cup B) = 0$

10. (8 Points) The _____ describes the number of occurrences of an event over a specified interval of time or space.

- a. Binomial random variable
- b. Poisson random variable
- c. Discrete random variable
- d. Continuous random variable

11. (8 Points) The mean of the binomial distribution is equal to

- a. p .
- b. $(n)(p)$.
- c. $p^x(1-p)^{n-x}$
- d. $(n)(p)(1-p)$

12. (8 Points) A random variable is said to be discrete if

- a. its outcomes are countable.
- b. it can assume any real number within an interval.
- c. the rules of probability apply.
- d. it can be represented graphically.

13. (8 Points) A standard normal distribution has a mean of _____ and standard deviation of _____

- a. zero, zero.
- b. zero, one.
- c. one, one.
- d. one, zero.

14. (8 Points) Which two distributions are useful in analyzing queues?
- Binomial and normal
 - Normal and exponential
 - Poisson and normal
 - Poisson and exponential
15. (8 Points) A student's grade on an examination was transformed to a z value which is negative. Therefore, we know that he scored
- higher than 16% of the class.
 - higher than 45% of the class.
 - above the first quartile.
 - below the mean.
16. (8 Points) Whenever the sampled population has a normal distribution, the sampling distribution of \bar{X} is a normal distribution
- for only large sample sizes.
 - for only small sample sizes.
 - for any sample size.
 - for only samples of size 30 or more.
17. (8 Points) For non-normal populations, as the sample size (n) _____, the distribution of sample means approaches a/an _____ distribution.
- decreases, uniform
 - increases, normal
 - decreases, normal
 - increases, uniform
18. (8 Points) A 82% confidence interval for a sampling distribution with a mean of 100, a sample standard deviation of 24 and a sample size of 36 will be based on a $\alpha/2 =$ _____ and a corresponding $Z_{\alpha/2}$ of _____ .
- .18 and .47
 - .18 and .915.
 - .09 and .23
 - .09 and 1.34
19. (8 Points) When the population is normally distributed, population standard deviation σ is unknown and the sample size is $n = 15$, the confidence interval for the population mean μ is based on
- the z (normal) distribution.
 - the t distribution.
 - the Binomial distribution.
 - the Poisson Distribution.

20. (8 Points) There is little difference between the values of $t_{\alpha/2}$ and $Z_{\alpha/2}$ when the sample
- size is small.
 - size is large.
 - mean is small.
 - mean is large.
21. (12 Points) The MPG (mileage per gallon) for a mid-size car is normally distributed with a mean of 32 and a standard deviation of .8. What is the probability that the MPG for a selected mid-size car would be less than 33.2?
22. (12 Points) Calculate the (i) mean, (ii) median, and (iii) mode of the following population of numbers:
- 9, 8, 10, 10, 12, 6, 11, 10, 12, 8
23. (12 Points) Consider the following population of five numbers: 5, 8, 10, 12, 15. Calculate the (i) range, (ii) variance, and (iii) standard deviation of this population.
24. (12 Points) A sprinkler system inside an office building has two types of activation devices, D1 and D2, which operate independently. When there is a fire, if either device operates correctly, the sprinkler system is turned on. In case of fire, the probability that D1 operates correctly is .95, and the probability that D2 operates correctly is .92. Find the probability that both D1 and D2 will operate correctly.
25. (12 Points) Bill and Mary are married. The probability that Bill watches a certain television show is .4. The probability that Mary watches the show is .5. The probability that Bill watches the show, given that Mary does, is .2. Find the probability that both Bill and Mary watch the show.
26. (12 Points) The following table summarizes investment outcomes and corresponding probabilities for a particular oil well:

$x = \text{the outcome in \$}$	$p(x)$
-\$40,000 (no oil)	.25
\$10,000 (some oil)	.7
\$70,000 (much oil)	.05

Find the expected monetary outcome.

27. (12 Points) The customer service department for a wholesale electronic outlet claims that 90 percent of all customer complaints are resolved to the satisfaction of the customer. A random sample of 10 customers who have filed complaints is selected. Assuming the claim is true, what is the probability that all 10 customers are satisfied?
28. (12 Points) Suppose that x has a Poisson distribution with a mean $\mu = 2$. Find $P(x > 0)$.
29. (12 Points) Assume the waiting time x for an elevator is uniformly distributed between zero and six minutes. Find $P(2 \leq x \leq 4)$.
30. (12 Points) The lifetimes of a particular brand of VCR are normally distributed with a mean of eight years and a standard deviation of six months. Find the probability $P(6.5 \leq x \leq 7.5)$, where x denotes the lifetime in years.
31. (12 Points) Suppose that x has a binomial distribution with $n = 200$ and $p = .4$. Make a continuity correction and then use the normal approximation to the binomial to find the probability $P(x \leq 95)$.
32. (12 Points) Suppose we randomly select a sample of size 100. The sampled population has a mean of 50 and a standard deviation of 1. What is the probability of obtaining a sample mean greater than 50.2?
33. (12 Points) Calculate a 98% confidence interval for the population proportion p , given that $\hat{p} = .1$ and $n = 300$.
34. (17 Points) Download the data set http://www.math.usu.edu/~symanzik/teaching/2006_stat2300/data/BikeSales.xls from the Web and use Excel to construct a 95% confidence interval for the average monthly bicycle sales. You should assume that the numbers reported are based on a random sample of interviewed sales staff and no exact computer records.
35. (17 Points) Download the data set http://www.math.usu.edu/~symanzik/teaching/2006_stat2300/data/Coke.xls from the Web and use Excel to calculate the (i) sample mean, (ii) median, and (iii) sample standard deviation for the number of “Coke Classic” cans that were found in the recycling containers of 10 randomly selected buildings at a large university.