

FULL NAME: \_\_\_\_\_

MTH 214, Fall 2010

Dr. Calandra Tate Moore

## Final Exam – Version A

The total score of this exam is 180 points. Each question is worth 15 pts.

READ ALL INSTRUCTIONS BEFORE BEGINNING THE EXAM

All answers should be written in the space provided. If you need more room, there is scratch paper available. Answers should be clearly marked. You may use standard calculators to assist with calculations but you will be expected to **SHOW ALL WORK!** Cell phones cannot be used as calculators. If I cannot see how you arrived at a given answer, you will not receive full credit. You are allowed to use your textbook during this exam. If you finish early, you may leave, but please be quiet on your way out, so as not to disturb your classmates.

Best Wishes and have a great break!

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**Problem 1:** A marketing research firm wishes to determine if the adult men in Laramie, Wyoming, would be interested in a new upscale men's clothing store. From a list of all residential addresses in Laramie, the firm selects 150 and mails a brief questionnaire to each.

- a) What is the sampling technique is being used?
- Simple random sampling.
  - Stratified random sampling.
  - Volunteer sampling.
  - Convenience sampling.
- b) What do we know about the chance that all 150 homes in a particular neighborhood in Laramie end up being the sample of residential addresses that is selected?
- It is the same as for any other set of 150 residential addresses.
  - It is exactly 0. Simple random samples will spread out the addresses selected.
  - It is reasonably large due to the "cluster" effect.
  - It is 150 divided by the size of the population of Laramie.
- c) The store reported that 58 of the men who received the mailing, or 39%, came into the store. Of the 58, about a quarter of them bought something. Which value(s) can be labeled as statistics?
- 150 and 58.
  - 58 and 39%.
  - 58, 39%, and 25%.
  - 39% and 25%.

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**Problem 2:** Weights of a popular brand of chocolate bars is claimed to be Normal with a mean of 8.1 oz and a standard deviation of 0.1 oz.

- a) If the quality control manager takes a simple random sample of ten chocolate bars from the production line, what is the probability that the sample mean weight of the ten sampled chocolate bars will be less than 8.0 oz?

- b) The quality control manager plans to take a simple random sample of size  $n$  from the production line. How big should  $n$  be so that the sampling distribution of  $\bar{X}$  has a standard deviation of 0.01 oz?

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**Problem 3:** A survey of 204 college students to the question, "How many CDs do you own?" resulted in the report of an average of 72.8 CDs with a standard deviation of 7.2. Calculate a 96% confidence interval for the true mean number of CDs owned. Explain what it means that this is a 96% interval for the mean.



**Problem 4:** Weather permitting, a concert is scheduled to be held in Central Park and bring a profit of \$50000. However, if the weather is bad, the event planners will have to cancel the event and stand to lose \$15000. The promoters have learned that this weekend, the weather man is calling for a 40% chance of rain.

- Write out <sup>the</sup> probability distribution table of  $X$  = event profit.
- Calculate the expected profit from the event.
- What is the standard deviation of the profit from the event?

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**Problem 5:** For the data set:

46 37 24 25 25 33 40 37 19 34 42 16 73 46

a) Find the 5-number summary.

b) Construct a box plot, be sure to properly label axis

c) Are there any outliers? Justify your answer

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**Problem 6:** As part of a promotion for a brand of wine, free tastings are offered to shoppers in a local supermarket. The probability a shopper will buy a bottle after tasting the free sample is .20. If we consider the next 15 shoppers,

(a) What is the probability that exactly 3 shoppers will buy a bottle of wine?

(b) What is the probability at least 3 shoppers will buy a bottle of wine?

(c) If we instead consider the next 100 shoppers, what is the probability that the number of shoppers who buy a bottle of wine exceeds 25?

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**Problem 7:** Circle the correct answer for the following multiple choice questions:

a) The Central Limit Theorem states that:

- i. if  $n$  is large then the distribution of the sample can be approximated closely by a normal curve
- ii. if  $n$  is large, and if the population is normal, then the variance of the sample mean must be small.
- iii. if  $n$  is large, then the sampling distribution of the sample mean can be approximated closely by a normal curve
- iv. if  $n$  is large, and if the population is normal, then the sampling distribution of the sample mean can be approximated closely by a normal curve

b) "Statistical methods may be described as methods for drawing conclusions about \_\_\_\_\_ based on \_\_\_\_\_ computed from the \_\_\_\_\_.

- i. statistics, samples, populations
- ii. populations, parameters, samples
- iii. statistics, parameters, samples
- iv. parameters, statistics, populations
- v. populations, statistics, samples

c) If most of the measurements in a large data set are of approximately the same magnitude except for a few measurements which are quite a bit larger, how would the mean and median of the data set compare and what shape would a histogram of the data set have?

- i. The mean would be smaller than the median and the histogram would be skewed with a long left tail.
- ii. The mean would be larger than the median and the histogram would be skewed with a long right tail.
- iii. The mean would be larger than the median and the histogram would be skewed with a long left tail.
- iv. The mean would be smaller than the median and the histogram would be skewed with a long right tail



## Final Exam - A FA10, MTH 214, Dr. C.T. Moore

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**Problem 8** You are given two boxes and asked to choose one item from each. One contains three balls colored yellow, orange, and pink and the other contains four slips of paper labeled 5, 6, 7, and 18.

a) List all possible outcomes in the sample space. How many outcomes are there?

b) What is the probability that:

i. You chose an odd number?

ii. An odd number or a pink ball?

iii. A number less than 20 and a yellow ball?

iv. A number greater than 20 and an orange ball?

## Final Exam - A FA10, MTH 214, Dr. C.T. Moore

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**Problem 9:** A trainer knows that the time it takes a participants to finish a certain task is normally distributed with mean 45 minutes with standard deviation 15 minutes.

a) If 45 minutes is allowed for the <sup>task</sup>exam, what proportion of participants would be unable to finish in the allotted time?

b) What is the chance that a randomly chosen participant will take between 20 and 45 minutes to complete the task?

c) If the trainer wants to make sure that 75% of the participants will have enough time to complete the task, how long should the she allow?

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**Problem 10:** The number of speed traps and the number of arrests for drunk driving over the past 5 weekends on a state highway was recorded as follows:

# of traps (x)	8	3	4	7	7
# of arrests (y)	10	6	8	9	4

Find and Interpret the correlation between the number of traps set and the number of arrests.

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**Problem 11:** Suppose  $\mu_1$  and  $\mu_2$  are true mean stopping distances at 50 mph for cars of a certain type equipped with two different types of braking systems. The following table summarizes data obtained from a study of the stopping times for each brake type:

Brake System	n	sample mean	sample std dev
System 1	6	115.7	5.03
System 2	5	129.3	5.38

Test at a .10 significance level that the true mean distance is equal to -5 versus the alternative that it is less than -5.



**Problem 12:** On any given Sunday during the football season, there are roughly 12 games being played. At each game, a fair coin is flipped to determine which team gets to kick off first. Let  $X$  = the proportion of these coins that land heads.

- a) What is the distribution of  $X$ , including its parameters?

