

**E370 Exam One
Fall, 2009-10
Version A**

INSTRUCTIONS

1. The only items allowed within your reach during an exam are calculators, the exam paper, pencils, erasers, a highlighter pen and your tool cards.
2. In the upper left corner of your NCS answer sheet PRINT YOUR LAST NAME. Skip a square and print your first name. Bubble in the corresponding spaces beneath those letters.
3. DO NOT FILL IN YOUR STUDENT ID NUMBER.
4. In spaces KLM, PRINT THE THREE DIGITS OF YOUR TEAM NUMBER. Bubble in the corresponding spaces beneath those numbers. **Do not leave any spaces between numbers.**
5. **WHOEVER PERFORMS #s 2, 3 & 4 ABOVE CORRECTLY WILL RECEIVE ONE POINT CREDIT!!!!**
6. Remember, a student is to avoid even the appearance of cheating. Keep your eyes on your exam or on the ceiling. If any member of the teaching team observes questionable behavior on your part, he or she has the right to confiscate your exam and ask you to leave the room.
7. **ANY** talking between students will be interpreted as cheating and all parties will fail the course.
8. Absolutely ALL cell phones must be turned off and out of reach. ANY cell phone usage for any purpose will be interpreted as cheating and the user will fail the course.
9. **ANY TOOL CARDS WHICH HAVE PHOTOCOPIED, COMPUTER GENERATED OR TYPE-WRITTEN INFORMATION ATTACHED TO THEM WILL BE CONFISCATED.**
10. There are 33 multiple choice questions on this exam. Each question is worth 3 points. **NOTE: EVEN THE HARD QUESTIONS ARE ONLY WORTH 3 POINTS!**
11. Don't let yourself get stuck on one question. Get all the answers you are sure of, then go back to the ones you are not sure of.
12. I believe that there is only one completely correct answer to each question on this test. Look for it and select it as your best choice.
13. Stay calm and do your best!

1. The sample variance of the reported years of education in a survey is 9. The sum of the squared deviations from the sample mean is 9891. The sample size is
- A. 1000 B. 1100 C. 1099 D. 1200

A department store analyzed its most recent sales and determined the relationship between the payment method used by the customer and the price category of the item, looking at single item purchases only. Use this information to answer the following **THREE** questions.

Number of sales (customers who buy one item)				
Item Price	Cash	Credit Card	Debit card	Total
< \$20	15		10	30
\$20 - \$100		45		85
> \$100	5		30	
Total		100	70	200

2. Which of the following is more likely to happen when a customer buys a single item?
- A. That she buys an item priced more than \$100 and pays with debit card.
 B. That she buys an item priced in the range \$20 - \$100 and pays with credit card.
 C. That she buys an item priced more than \$100 and pays with credit card.
 D. That she buys an item priced in the range \$20 - \$100 and pays with debit card.
3. Given the purchase of a single item priced less than or equal to \$100, which of the following is true?
- A. More than 50% of buyers pay either with cash or debit card.
 B. 30% of the customers pay with credit card.
 C. Less than 30% of the customers pay with debit card.
 D. None of the above.
4. If method of payment is independent of the price of an item in a single-item purchase, how many sales would you expect to find in the shaded cell?
- A. 5 B. 20 C. 12 D. 15

The following are partial Descriptive Statistics output as calculated by Excel. The data are annual Burglary and Larceny/Theft rates in the US from 1960 to 2008. The data are measured in rates as number of crimes per 1,000 inhabitants, rounded to two decimals. Use this output to answer the following **FOUR** questions. **Note: the questions continue onto the next page.**

Burglary		Larceny/Theft	
Mean		Mean	24.47
Median	10.42	Median	25.51
Standard Deviation		Standard Deviation	6.58
Sample Variance	10.87	Sample Variance	
Minimum		Minimum	10.35
Maximum		Maximum	32.29
Sum	511.52	Sum	
Count		Count	49

5. Which of the following most accurately describes the shapes of the distributions?
- Both burglary and larceny-theft rates are pretty symmetric, indicating that these types of delinquencies have kept their patterns across time.
 - Burglary rates are slightly left skewed reflecting the fact that most of the years have been more dangerous than expected with respect to this type of crime, while larceny-thefts are right skewed indicating that most of the years have been safer than expected with respect to this type of crime.
 - Burglary rates are almost perfectly symmetric, indicating that there has been minor and balanced changes in the distribution of safe and unsafe years in the last 49 years with respect to this type of crime, while larceny-theft is slightly left skewed reflecting that more than 50% of the years have been more dangerous than expected with respect to this type of crime.
 - Burglary rates are heavily right skewed reflecting the fact that almost all of the years have been more dangerous than expected with respect to this type of crime, while larceny-theft are left skewed reflecting that there have been years more dangerous than expected with respect to this type of crime.
6. If the average burglary rates for the decades of the 60's, 70's, 80's and 90's are, respectively: 6.9, 13.07, 13.97, and 10.28, what is the average burglary rate for the period 2000-2008?
- 10.44
 - 6.93
 - 8.67
 - 7.70
7. What is the correct variance of Larceny/Theft rates?
- 2.57
 - 43.30
 - 42.41
 - 7.07

8. Of Burglary and Larceny/Theft rates, which is more homogeneous across the years?
- A. Burglary rates.
 - B. Larceny/Theft rates.
 - C. They are equally homogeneous.
 - D. There is insufficient information to tell.
9. A sample data set has a mean of 10 and a variance of 4. Suppose that all the observations in the data set are multiplied by 5. What will the mean and variance of the data set be after this operation?
- A. The mean will be 15 and the variance will be 100.
 - B. The mean will be 50 and the variance will be 20.
 - C. The mean will be 15 and the variance will be 20.
 - D. The mean will be 50 and the variance will be 100.

A study to determine the relationship between the salaries of CEO's and the return on equity (ROE) of the company yielded the following least squares line:

$$\text{Salary}' = 963.2 + 18.5 * \text{ROE}$$

with salary measured in thousands of dollars (\$ K) per year and ROE in percentage units. Use this information to answer the following **TWO** questions.

10. If the return on equity of one firm increases by 2%, what would be the expected increase in the CEO's salary?
- A. About \$ 1 million per year.
 - B. \$ 37 K per year.
 - C. \$ 18.5 K per year.
 - D. About \$ 982 K.
11. The CEO of a firm whose ROE is 30% is expected to make
- A. \$ 2.48 million per year.
 - B. \$ 965 K per year.
 - C. \$ 1.52 million per year.
 - D. There is insufficient information to answer this question.
12. Categories of a histogram are exhaustive when
- A. there is a meaningful zero point.
 - B. the observations can be ranked.
 - C. each observation appears in at least one category.
 - D. each observation appears in only one category.

13. Two of Manuel's sections earned the same average on an end-of-lab quiz, valued at 4 points total. Students in his first section had a median score of 2, while those in his second section had a median score of 3. With the given information, which of the following is true?
- A. Student's scores were generally higher in his second section than in his first.
 - B. There was no discernable difference in student's scores for his two sections.
 - C. Student's scores were generally lower in his second section than in his first.
 - D. None of the above.

In a study investigating the effect of car speed on accident severity, 5000 reports of fatal car accidents were examined, and the vehicle speed at impact was recorded for each one. For these 5000 accidents, the average speed was 42 mph and the standard deviation was 15 mph. The distribution of vehicle speeds at impact is symmetric and bell shaped. Use this information to answer the following ***THREE*** questions.

14. Over which of the following speed intervals did approximately 2375 fatal car accidents occur?
- A. (42, 72).
 - B. (27, 57).
 - C. (12, 72).
 - D. (42, 57).
15. Roughly, what number of fatal car accidents occurred at more than 57 mph?
- A. 300
 - B. 500
 - C. 800
 - D. 1000
16. Approximately, what is the minimum number of accidents Chebyshev would predict between plus and minus 1.5 standard deviations of the mean, to the nearest whole number?
- A. 3333
 - B. 2778
 - C. 2222
 - D. 1667
17. A sample of 99 distances has a mean of 24 feet and a median of 24.5 feet. Unfortunately, it has just been discovered that an observation which was erroneously recorded as "30" actually had a value of "35". If we make this correction to the data, then:
- A. the mean remains the same, but the median is increased
 - B. the mean and median remain the same
 - C. the median remains the same, but the mean is increased
 - D. the mean and median are both increased

18. By definition, the least squares line implies that
- A. the sum of the squared differences between the observed values of Y and the predicted values of Y is always zero.
 - B. the sum of the squared differences between the observed values of Y and the predicted values of Y, as long as it is the smallest, can be any value, positive or negative.
 - C. the sum of the squared differences between the observed values of Y and the predicted values of Y, although small, is almost always bigger than zero.
 - D. None of the above
19. One hundred people who had recently purchased motorcycles were surveyed. Data on the following variables were gathered and recorded in this order: gender of purchaser, brand of motorcycle purchased, number of previous motorcycles owned by purchaser, telephone area code of purchaser, weight of motorcycle as equipped at purchase. The classification of the variables in the same order in which they were recorded is:
- A. Nominal, ordinal, discrete, ordinal, discrete.
 - B. Nominal, nominal, continuous, ordinal, continuous.
 - C. Nominal, ordinal, continuous, nominal, ordinal.
 - D. Nominal, nominal, discrete, nominal, continuous.
20. A researcher planning a survey of heads of households in a particular state has census lists for each of the 23 counties in that state. The procedure will be to obtain a random sample of heads of households from each of the counties rather than grouping all the census lists together and obtaining a sample from the entire group. What type of sampling method is this?
- A. Systematic random sample.
 - B. Stratified random sample.
 - C. Simple random sampling.
 - D. Cluster sampling.
21. A game console was launched at a price of \$600 on January 1st in 2004, and has decreased in price by \$100 on January 1st each year through the year 2009. What is the standard deviation of the prices of this console?
- A. \$170.78 B. \$177.95 C. \$187.08 D. \$194.94

An automobile insurance company estimates the following loss probabilities for the next year on a \$10,000 motorcycle. Use this information to answer the following **FOUR** questions.

Percent Loss	Probability of Loss
Total loss	0.001
50% loss	0.010
25% loss	0.050
10% loss	0.100

22. How much does the insurance company expect in losses per motorcycle for the next year?
- A. \$285
B. \$1610
C. \$1805
D. \$9025
23. Assume that the expected loss was \$500 per motorcycle for the next year. What is the standard deviation of the per motorcycle loss for the next year?
- A. \$50.75 B. \$56.57 C. \$719.55 D. \$852.94
24. Describe the shape of the loss distribution.
- A. The distribution is extremely right skewed, reflecting the low probability of a total loss.
B. The distribution is extremely left skewed, reflecting the high probability of no loss.
C. The distribution is very flat reflecting the tiny differences in probabilities of the various levels of loss.
D. The distribution has a single peak and is thus very symmetric.
25. What is the value of the median loss?
- A. \$0 B. \$1000 C. \$2500 D. \$5000
26. In a right skewed histogram, the percentage of observations to the right of the mean will be
- A. more than 50%.
B. less than 50%.
C. exactly 50%.
D. between 50% and 75%

This stem-and-leaf diagram represents a random sample of returns on Coca-Cola stock. The negative values represent negative returns; this affects the arrangement of the leaves, which are consistently from smaller to larger values. For example, the minimum value is -0.37.

-0.3	7	6	4	0	0
-0.2	2	2			
-0.1	8	6	2	1	0
-0.0	5	4	1		
0.0	1	9			
0.1	3	4	7		
0.2	2	9			
0.3	1	8			
0.4	0				

27. What is the 80th percentile for this data set?
- A. 0.208
 B. 0.21
 C. 0.22
 D. 20.8
 E. 28
28. If every stem represented a class in a frequency distribution in which classes were one-tenth of a percent wide, what is the lower bound on the first class?
- A. -0.2 B. -0.3 C. -0.37 D. -0.4
29. Using data from a sample of golfers, the following covariances were calculated. The covariance of number of strokes and number of putts was 58.95; for number of strokes and minutes of playing time for 18 holes the covariance was 20.53; and for number of putts and minutes of playing time, the covariance was 42.71. Which of the following statements are accurate interpretations of these statistics?
- A. A linear relationship exists between number of strokes and minutes of playing time, but the relationship between number of putts and minutes of playing time is stronger and non-linear.
 B. When number of strokes is low so is playing time, but when number of putts is high, playing time is high.
 C. There is a linear relationship between number of strokes and number of putts, but the relationship between number of strokes and minutes of playing time is much weaker.
 D. A and B are both correct.
 E. B and C are both correct

30. Which of the following statements is FALSE?
- A. A summary measure calculated from all items of interest is a parameter.
 - B. A summary measure calculated from some of the items of interest is a statistic.
 - C. The main goal of descriptive statistics is to estimate characteristics of populations.
 - D. Statistical inference is the process of making a prediction based on only a small piece of information.
31. A recent study of breast cancer revealed that 13% of the women in the sample used antibiotics more than 500 days in their lifetime and 79% of those women developed breast cancer. According to the American Cancer Society, one in twelve women will develop breast cancer at some time in her life. Of the numbers mentioned, which are parameters?
- A. 13% and 79%
 - B. 13% and one in twelve
 - C. 79% and 500 days
 - D. one in twelve
32. You want to purchase two of your favorite stocks, Disney and Chiquita Bananas. You contact your broker and are told that the expected return on \$100 in Disney is \$200 with a standard deviation of \$30. The expected return on \$100 in Chiquita Bananas, however, is \$500 with a standard deviation of \$75. Which stock would represent the least risky investment?
- A. Both stocks have the same risk.
 - B. Chiquita Bananas
 - C. Disney
 - D. It is impossible to tell.
33. Based on 1988 census data for the 50 States in the United States, the correlation between the number of churches per State and the number of violent crimes per State was 0.85. We can conclude that
- A. there is a causal relationship between the number of churches and the number of violent crimes committed in a city.
 - B. since the data comes from a census, or nearly complete enumeration of the United States, there must be a causal relationship between the number of churches and the number of violent crimes.
 - C. the relationship is not causal because only correlations of +1 or 1 show causal relationships.
 - D. the correlation is spurious because of the confounding variable of population size: both number of churches and number of violent crimes are related to the population size.

Answers:

- | | |
|----|----------|
| 1 | B |
| 2 | C |
| 3 | A |
| 4 | D |
| 5 | C |
| 6 | D |
| 7 | C |
| 8 | B |
| 9 | D |
| 10 | B |
| 11 | C |
| 12 | C |
| 13 | A |
| 14 | A |
| 15 | C |
| 16 | B |
| 17 | C |
| 18 | C |
| 19 | D |
| 20 | B |
| 21 | A |
| 22 | A |
| 23 | D |
| 24 | A |
| 25 | A |
| 26 | B |
| 27 | B |
| 28 | D |
| 29 | B |
| 30 | C |
| 31 | D |
| 32 | A |
| 33 | D |