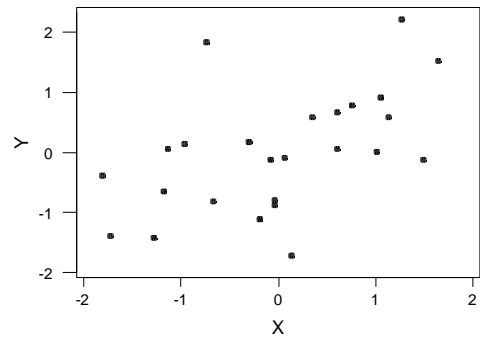


# Final Exam 2 May 14, 1997, Quant II Form A

The 40 exam questions and answer sheet are both to be turned in to your Discussion Section instructor at the end of the exam. Code your name and ID number on the answer sheet. **Code your Section number under OPTIONAL CODES in positions L M N.**

1. Consider 4 Bernoulli trials with success probability  $\pi = 0.2$ . What is the probability of observing *at least one* success?
  - A)  $4(0.2)^1(0.8)^3$
  - B)  $(0.8)^4$
  - C)  $1 - (0.8)^4$
  - D)  $\sqrt{4(0.2)(0.8)}$
  - E)  $4(0.2)$
2. If a process is in control (stable), the process is expected to produce goods or services that meet the customers expectations.
  - A) True
  - B) False
3. In the multiple regression example in the British Steel video, they were using two continuous predictor variables, amount of carbon in the steel plate and amount of carbon in the welding wires, to predict the amount of carbon in the final weld. Their regression model is best described as
  - A) one line
  - B) two parallel lines
  - C) one quadratic curve
  - D) a plane
  - E) a quadratic surface
4. A simple random sample of size 100 is selected from the population of Fortune 500 companies. (There are exactly 500 of these companies.) The variable sampled has a population mean of \$50,000 and a standard deviation of \$3,000. What is the standard error of the sample mean?
  - A) 240
  - B) 268
  - C) 300
  - D) 3000
  - E) Cannot be determined from the information given.
5. Control charts reflect both the cross-sectional and longitudinal aspects of a process.
  - A) True
  - B) False
6. A parameter is a numerical characteristic of a sample.
  - A) True
  - B) False

7. One of the following equations is the least squares regression line for the scatterplot at the right. Which one is it?

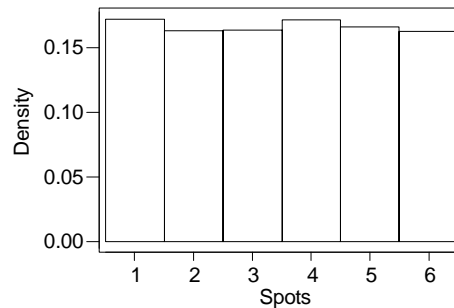
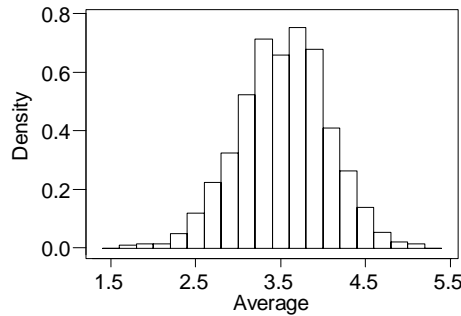


- A)  $y = 1 + 0.5x$
- B)  $y = -1 + 0.5x$
- C)  $y = x$
- D)  $y = -1 + x$
- E)  $y = 0.5x$

8. Common causes are individually small, unobserved influences on process results.

- A) True
- B) False

9. Ten dice were rolled and the average number of spots calculated. This process was repeated 1000 times. The density histograms for the 1000 Averages and for the 10,000 individual dice rolls are shown below. Which of the following statements are illustrated in the plots?



- A) The approximate normality of the sampling distribution of the sample mean.
  - B) The fact that the mean of the mean is the mean.
  - C) The fact that  $\sigma_{\bar{y}} = \sigma / (\sqrt{n})$ .
  - D) The uniform distribution of the individual spots on the dice.
  - E) All of the above.
10. The results produced by a constant-cause system vary, and may vary over a wide band or a narrow band.
- A) True
  - B) False
11. The distribution of womens' heights is (approximately) a normal distribution with mean 65.5 inches and standard deviation 2.5 inches. If four randomly chosen women stand on top of one another, what is the chance that their total height exceeds 260 inches? (Round to the nearest hundredth.)
- A) 0.40
  - B) 0.34
  - C) 0.66
  - D) 0.80
  - E) None of the above.

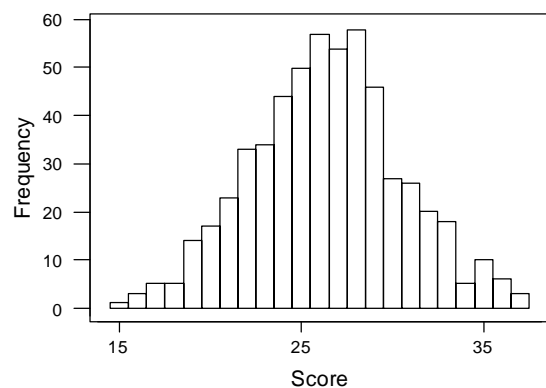
12. The table below gives the breakdown of shoe sale transactions over a long period for a large shoe chain. An auditor selects one transaction at random from all of the transactions.

		Brand Purchased		
		Reebok	Nike	Other
Type of Purchase	Cash	5%	10%	5%
	Credit Card	35%	20%	25%

What is the chance that a Credit Card transaction is selected?

- A) 20%  
 B) 35%  
 C) 55%  
 D) 80%  
 E) None of the above.
13. Refer to the previous problem. Given that a Credit Card transaction is selected, what is the chance that it is a Nike transaction?
- A) 20%  
 B) 25%  
 C) 30%  
 D) 35%  
 E) None of the above.
14. The  $t$  distribution with 10 degrees of freedom has a larger standard deviation than the standard normal distribution.
- A) True    B) False
15. In a simple random sample, increasing the sample size will decrease the margin of sampling error (other things being equal).
- A) True    B) False

16. A histogram of the second midterm exam scores is shown at the right. Which of the following values is closest to the standard deviation of these scores?



- A) 2  
 B) 4  
 C) 8  
 D) 12  
 E) 22
17. A switch to a temporary new supplier of raw materials would be considered a common cause of variation.
- A) True    B) False

18. A universe consists of 8 elements. How many samples of size 3 (without replacement) are possible?
- A) 8
  - B) 24
  - C) 336
  - D) 6720
  - E) None of the above.
19. As discussed in lecture, “A leading pollster has repudiated a widely publicized survey that seemed to show that a third of Americans were open to the possibility that the Holocaust never happened. ‘The so-called Holocaust question was flawed,’ said Burns Roper...” This was an example of:
- A) a Type I error
  - B) a sampling error
  - C) a non-sampling error
  - D) a frame error
  - E) interviewer bias
20. Which of the following plots is used to assess whether a regression line models the shape of the relationship between  $y$  and  $x$ ?
- I. a plot of residuals versus fitted values
  - II. a plot of residuals versus  $x$
  - III. a normal scores plot of residuals
- A) I and II only
  - B) II and III only
  - C) I and III only
  - D) I, II, and III
  - E) None of A), B), C), or D)
21. Common causes are considered to be due to chance and to remain in the system unless the process is itself altered.
- A) True
  - B) False
22. The article “A Pollster’s Worst Nightmare: Declining Response Rates” discussed the importance of
- A) coverage errors
  - B) avoiding ambiguous questions
  - C) sampling errors
  - D) avoiding interviewer bias
  - E) having a large sample size

23. Which *one* of the following statements is *false* regarding control charts?
- A) Control charts can help avoid tampering with a stable process.
  - B) Control charts can help managers decide when to take action concerning their processes.
  - C) Control charts help managers detect special causes of variation in their processes.
  - D) Control charts can be applied to service businesses as well as manufacturing.
  - E) Control charts were invented by the Japanese within the last 20 years.
24. In a probability survey, increasing the sample size will decrease nonsampling errors.
- A) True    B) False
25. Longitudinal data were collected on quarterly sales, a continuous seasonal variable, but they were given to us only in numerical order from smallest value to largest value rather than in time order. Which of the following could we produce from the data as given?
- I. a density histogram of sales
  - II. the mean sales
  - III. a sequence plot of sales with appropriate plotting symbols
- A) I and II only
  - B) II and III only
  - C) I and III only
  - D) I, II, and III
  - E) None of the above.
26. If a set of data is standardized using the mean and standard deviation of that data, the standard deviation of the standardized data will be 0. (Assume that the original numbers are not all equal to the same value.)
- A) True    B) False
27. In an observational study randomization is *not* used to select elements for observation.
- A) True    B) False
28. A variable  $y$  is either 0 with probability 0.5 or 2 with probability 0.5. What are the expected value and standard deviation of  $y$ ?
- A)  $\mu = 0.5$  and  $\sigma = 0$
  - B)  $\mu = 0.5$  and  $\sigma = 0.5$
  - C)  $\mu = 1$  and  $\sigma = 0$
  - D)  $\mu = 1$  and  $\sigma = 1$
  - E)  $\mu = 0$  and  $\sigma = 1$
29. A *Type I error* is rejecting a true null hypothesis.
- A) True    B) False

30. A line was fit using least squares to the data in the table. The fitted values and residuals are also given.

$x$	$y$	Fitted	Residual
7	510	504.88	5.12
8	503	505.18	-2.18
10	500	505.80	-5.80
12	504	506.42	-2.42
13	512	506.72	5.28

Which of the following statements is (are) true? (Sketch appropriate plots.)

- I. The data would fit a quadratic model a lot better.
- II. The slope of the fitted line is between 0.40 and 0.45
- III. The sum of squared residuals is between 97 and 99.

- A) III only
- B) I and III only
- C) II and III only
- D) I, II, and III
- E) None of A), B), C), or D)

31. Which of the following plots is used to assess whether a set of residuals comes from a normal distribution?

- I. a plot of residuals versus fitted values
- II. a normal scores plot
- III. a sequence plot

- A) I only
- B) II only
- C) III only
- D) I, II, and III
- E) None of A), B), C), or D)

32. An auditor must audit an inventory of 90,000 items. Unfortunately time and budget does not allow a census so she must base her conclusions on a simple random sample of 100 items. After selecting the sample data she finds a sample mean of \$134 and sample standard deviation of \$80. What is her *margin of error* in estimating the mean value of the 90,000 items in the inventory if she uses a 95% confidence level?

- A) \$16
- B) \$80
- C) \$134
- D) \$160
- E) Cannot be determined from the information given.

33. According to an article in the *American Banker*, last year 10% of the banking public quit their bank and took their business elsewhere. This came from a simple random sample of 1,130 American banking patrons. What is the upper endpoint of a 95% confidence interval for the percent of *all* American banking patrons that quit their bank last year and took their business elsewhere? (Round to nearest tenth of a percent.)
- A) 10.0%
  - B) 10.9%
  - C) 11.8%
  - D) Cannot be determined from the information given.
  - E) None of the above.
34. Suppose that only 10% of all risky ventures are successful. However, *Acme Management Consultants* have devised a procedure that predicts the success or failure of risky ventures. Their “track record” is 80% correct predictions with ventures that turn out to succeed and 90% correct predictions with ventures that end up in failure. That is, we have the following conditional probabilities:  $Pr(\text{Acme predicts success} \mid \text{Venture a success}) = 0.8$  and  $Pr(\text{Acme predicts failure} \mid \text{Venture a failure}) = 0.9$ . You hire *Acme* to help you decide whether or not to proceed with a risky venture. Their prediction is that the venture will be successful. Given their prediction, what is your conditional probability that the risky venture will be successful? (Round to the nearest whole percent.)
- A) 10%
  - B) 47%
  - C) 80%
  - D) 90%
  - E) None of the above.
35. One coin is flipped and one die rolled. What is the probability of getting either a head or 6 spots (or both)?
- A)  $1/2 + 1/6$
  - B)  $(1/2)(1/6)$
  - C)  $1/2 + 1/6 - (1/2)(1/6)$
  - D)  $1/2 + 1/6 + (1/2)(1/6)$
  - E) None of the above.
36. Consider a  $t$ -distribution with 9 degrees of freedom. What is the value of the 90th percentile, that is, the point below which 0.90 of the area lies?
- A) 1.383
  - B) 1.397
  - C) 1.833
  - D) 1.860
  - E) None of the above.

37. The joint distribution of two variables  $x$  and  $y$  is given in the table at the right. Find the covariance between  $x$  and  $y$ .

- A)  $1/16$
- B)  $1/4$
- C)  $3/16$
- D)  $5/16$
- E) None of the above.

	y		
x	0	1	
0	$3/4$	0	
1	0	$1/4$	

38. A business needs to estimate a population proportion  $\pi$  to an accuracy of plus or minus 5 percentage points with 95% confidence. They have 10,000 employees in the population of interest. What size simple random sample will achieve these goals? (Assume the population proportion is near 0.5.)

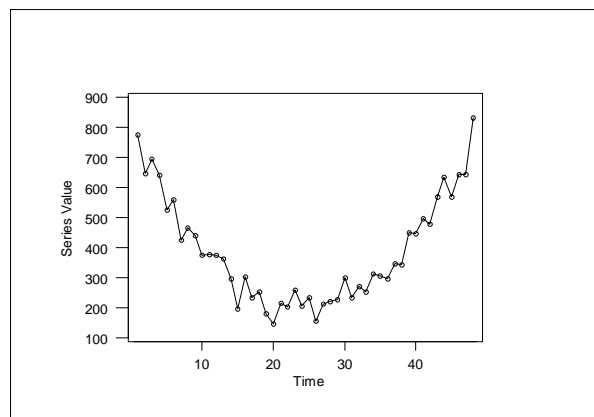
- A) 268
- B) 386
- C) 400
- D) 500
- E) 1009

39. Our marketing manager is interested in average product usage in a particular market segment. A random sample of 16 customers from a large universe gave a mean number of units purchased of 20.81 and a sample standard deviation of 2.66 units. A competitor claims their mean number of units purchased is 19.12. Is our mean statistically significantly larger than their claim? (Use a significance level of 5% and assume the population is approximately normal.) Which of the following correctly describes our conclusion?

- A) Reject the null hypothesis since the  $t$ -ratio is 2.54 and we have 15 degrees of freedom.
- B) Reject the null hypothesis since the  $t$ -ratio is 2.54 and we have 16 degrees of freedom.
- C) Do not reject the null hypothesis since the  $t$ -ratio is 2.54 and we have 15 degrees of freedom.
- D) Do not reject the null hypothesis since the  $t$ -ratio is 2.54 and we have 16 degrees of freedom.
- E) Not enough information given to make conclusion.

40. The sequence plot of a time series of 48 monthly values is shown at the right. The lag 1 autocorrelation coefficient for this series is best described as: (Hint: What would the plot of the series versus the lag 1 of the series look like?)

- A) Strongly negative
- B) Moderately negative
- C) Near zero
- D) Moderately positive
- E) Strongly positive



# Defective Question Report

Name: \_\_\_\_\_

Section: \_\_\_\_\_

ID: \_\_\_\_\_

**Circle one:** Form A B C D

If you believe that a test question is defective in some way, please list your complaint here. All complaints will be considered in our interpretation of the test results.

To correctly identify the test question we must know which **form** of the test you have taken. ***We also must know how you answered the question.***

**Remove this last page from the exam questions and turn it in to one of the instructors in the course.**

Question number: