

# Final Exam

Math 114-F

Saturday, December 8, 2001

For full credit show all work. When in doubt, explain your reasoning.

1. Given the following sample data, find the  $z$ -score for 28.

28, 40, 52, 63, 75, 90

2. Roll two fair dice. Let  $A$  be the event that the sum of the dice is at least 10. Let  $B$  be the event that the dice faces differ by one. (For example, rolling a 2-3 or a 6-5 would make  $B$  true.)

Are  $A$  and  $B$  independent events?

3. Let  $X$  be a Poisson random variable with mean 13. Find  $P(10 \leq X \leq 15)$ .
4. How many ways can a nine-person baseball team be chosen from a group of twelve people?
5. Construct a modified boxplot for the following data, and label the parts of it (such as outliers, quartiles, median, etc.).

12, 6, 0, 22, -99, 82, 29, 40, 14, 96, 70, 32, 5, 37, 175

6. You flip a fair coin thirty times. What is the probability of getting at least one head?
7. Explain what kind of relation (increasing or decreasing) there is between the following numbers used in computing a confidence interval:
  - (a) sample size and confidence level
  - (b) sample size and margin of error
  - (c) confidence level and margin of error
8. A sample of size 80 is taken from a population with mean 100 and standard deviation 25. What is the probability that the sample mean is between 95 and 105?
9. Explain which of the mean and the median is more affected by outliers.

10. Explain how self-selection can bias a sample and give an example.
11. Why is a confidence interval more useful than a point estimate of a population parameter?
12. What has to be true about events  $A$  and  $B$  for  $P(A \cup B) = P(A) + P(B)$  to be true? Give an example of specific events that make this equation true.
13. State the Empirical Rule in terms of  $z$ -scores for a sample.
14. Given the following sample, find the probability that someone chosen at random from the sample is over 50 given that they are from Virginia?

	NC	TN	VA
Under 50	35	60	52
Over 50	39	17	82

15. What are the differences between discrete and continuous random variables? Give an example of each.
16. Explain the difference between an observational study and an experiment.
17. How large a sample size do you need to estimate a population proportion to within 0.04 with a 90% confidence interval?
18. Construct a scatterplot for the following data and test at a 5% significance level whether or not there is a nonzero population correlation coefficient.

$x$	2	4	6	8	10	12	14	16
$y$	3	1	4	1	5	9	2	2

19. Use the following sample data to test at a 5% significance level whether or not the population mean differs from 28.2.

27, 18, 28, 18, 28, 45, 90, 45

20. If  $X$  is uniformly distributed between 15 and 30, what is  $P(20 \leq X \leq 24)$ ?
21. Given that the following data shows a significant correlation, find the linear regression equation and use it to predict  $y$  when  $x = 30$ .

$x$	2	3	5	7	11	13	17	19
$y$	7	8	16	20	32	38	52	56

22. Find a 99% confidence interval for the population standard deviation given a sample with size 28 and standard deviation 13.1.

23. Test at a 5% significance level whether or not 30% of the population has Type A blood, given that out of a sample of 350 people, 100 have Type A blood.
24. Let  $X$  be a binomial random variable with  $n = 10,000$  and  $p = 0.45$ . Use a normal approximation to find  $P(4450 \leq X \leq 4550)$ .
25. What is the difference between descriptive and inferential statistics?